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JPRS Report

Africa
(Sub-Sahara)

GUIDE TO COUNCIL FOR SCIENTIFIC, INDUSTRIAL RESEARCH

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AFRICA (SUB-SAHARA)

GUIDE TO COUNCIL FOR SCIENTIFIC, INDUSTRIAL RESEARCH

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[Text]

COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH (CSIR)

Scientia, Pretoria
P O Box 395, Pretoria, 0001

Telephone: National (012) 86-9211
International + 27 12 86-9211
Telegrams: NAVORS, Pretoria
Telex: 3-630

President:	Dr C F Garbers
Deputy Presidents:	Dr J F Kemp
	Dr E N van Deventer
	Dr G Heymann
	Prof. R R Arndt
	Dr J B Clark
Total staff:	Approx. 5 000

The Council for Scientific and Industrial Research (CSIR) was established by statute in 1945. The Chairman of the Council of twelve members, appointed by the State President from amongst eminent scientists and industrialists, is also the full-time Executive President of the organization. The Council reports to a Cabinet Minister designated by the State President (at present the Minister of Trade and Industry).

The organization is administered by an Executive consisting of the President and six Deputy Presidents to whom the Chief Directors of institutes and heads of other organizational units report.

The Council's major source of funds (varying from 60 to 70 per cent of its total income) is an annual grant voted by Parliament. In addition, the research is supported financially by government agencies, provincial administrations and other organizations, and the Council derives a substantial income from contract laboratory work undertaken for industrial and other organizations.

Aims: To help develop the human and materials resources of South Africa and Help create a sound infrastructure for economic development, as well as to improve the quality of life of the population.
In pursuance of these aims the CSIR undertakes research (covering various disciplines of science and engineering as well as fields of application) and supports research at universities and other institutions in South Africa.

Research, laboratories and institutes: The Council has 19 national research laboratories and institutes. The headquarters and most of the laboratories are located at Scientia, the Council's research centre in Pretoria. The National Institute for Coal Research (formerly the Fuel Research Institute of South Africa) is located on a separate site opposite the University of Pretoria. The National Institute for Telecommunications Research is situated in Johannesburg, while the National Research Institute for Oceanology is in Stellenbosch and the South African Wool and Textile Research Institute in Port Elizabeth. The South African Astronomical Observatory in Cape Town (which has national institute status), the National Accelerator Centre at Faure and the Magnetic Observatory at Hermanus are also part of the CSIR organization.
A further 2 research centres and 9 research units at various universities and museums are supported financially by the CSIR.

Industrial research: In addition to undertaking sponsored projects for industrial firms on a confidential contract basis, the CSIR actively promotes research by industry, *inter alia* by means of joint ventures with industrial concerns. Three industrial research institutes, the Leather Industries Research Institute in Grahamstown, the Fishing Industry Research Institute in Cape Town and the Sugar Milling Research Institute in Durban, are operated as non-profit companies with pro rata financial support from the CSIR.

Research development: The CSIR's responsibility for the development of scientific research in South Africa is carried out in part by the Foundation for Research Development (FRD).

One of the activities of the FRD is to fund and support research initiated by universities, museums and technikons. The CSIR was first given this legal responsibility in 1946. State funds provided for the purpose are managed by the Main Research Support Programme, and are awarded to post-graduate students and established researchers on the basis of merit. Researchers are assessed on the basis that, if funded, they will produce good results in their areas of research. Grants for overseas study and research are given on an ad hoc merit basis. The FRD is assisted by the Main Research Support Programme's Advisory Committee (the Main Awards Committee) and its various specialist subcommittees on which academic staff of various universities and museums are nominated to serve.

In contrast to support for self-initiated research, the National Programmes of the FRD aim at solutions to well-defined national problems through cooperative research. The National Programmes were created to meet the need for research into problems of national and internatonal importance by mobilizing available expertise. These coordinated efforts focus on interdisciplinary and multi-institutional approaches to complex problems which are unlikely to be solved by organizations working in isolation. Earlier programmes, several of which are still in progress, arose from participation in global ventures of the International Council of Scientific Unions (ICSU). Later programmes were launched mainly to meet national needs. The scientific coordinators, in collaboration with scientists and managers in statutory organizations, universities, government departments and the private sector, are responsible for the planning and development of these programmes.

Stimulation Programmes will be initiated in order to encourage research in favoured fields which have been identified. In all the Programmes, only applicants who have been evaluated will be considered for research support.

FRD's budget for research development is R35 million, of which R15 million will be used to support research at universities and museums and for post-graduate bursaries. The other R20 million will be used to support research through national programmes in the fields of ecosystems, energy, waste management, renewable feedstocks, ocean and earth sciences, weather research, remote sensing and micro-electronics. In addition, a national Antarctic research programme is funded by the Department of Transport to the amount of R1,8 million.

Scientific and technical information: As the principal scientific organization in the Republic, the CSIR has specific responsibilities for the collection, storage, retrieval and dissemination of scientific and technical information. The central responsibility for this function is vested in the National Institute for Informatics.

The results of research undertaken or supported by the CSIR are published in local and overseas scientific and technical journals and in various publications issued by the CSIR itself.

International relations: The CSIR has a major responsibility in respect of South Africa's international relations in science. This aspect is reviewed annually by an Advisory Committee on International Cooperation in Science. Links with the International Council of Scientific Unions are maintained by the CSIR's International Relations Division. The CSIR also maintains South African science offices in Bonn, London, Paris, Washington and Los Angeles (see page 22).

APPLIED CHEMISTRY UNIT (ACU)

Scientia, Pretoria
P O Box 395, Pretoria, 0001

Telephone: National (012) 86-9211
International + 27 12 86-9211
Telex: 3-21312SA

Head: Dr V P Joynt X 2695
Total staff: 18 (excluding seconded staff)

Functions: This Independent Unit is largely financed on a contract basis by outside organizations to undertake studies on the application of chemistry to various production and engineering problems. These studies are frequently joint programmes in which the sponsors second staff to the ACU to contribute directly to the research and development effort.

CHEMICAL ENGINEERING RESEARCH GROUP (CERG)

Scientia, Pretoria
P O Box 395, Pretoria, 0001

Telephone: National (012) 86-9211
International + 27 12 86-9211
Telex: 3-21312

Head:	Mr W G B Mandersloot	X 2358, 2356
Deputy Head:	Dr R E Hicks	X 2361, 2356
Administration, Finance and Personnel:	Mrs E S T Miller	X 2676, 2356
Liaison Officer:	Mr D Heinichen	X 2360, 2356
Total staff:	59	

Functions: To study problems in the transfer of heat, mass and momentum, and in particle technology mainly in areas where insufficient design information is available; to develop programs for computer-aided design and evaluation including experimental methods for the determination of the physical and thermodynamic properties of chemical compounds and mixtures under conditions as prevailing in plant operation; to develop and evaluate catalysts for hydrocarbon synthesis from carbon monoxide or alcohols and to converse the lower olefins to liquid motor fuels and petrochemicals.

Advisory and research services: General information and consulting services for the process industry, particularly on the prevention of air pollution and on emission measurement; consulting services on the processing and characterization of particulate matter (particle size, surface area, pore size distribution, etc.) as well as on the determination of the battery activity of manganese dioxide; computer-aided cost-optimized design and rating of heat exchangers; provision or determination of thermodynamic physical or rheological properties of substances and mixtures; chemical and physical processing studies (drying, extraction, filtration, evaportation, etc.) on a semi-technical scale; techno-economic feasibility studies.

Special facilities: Semi-technical scale equipment for spray drying, tray drying, vacuum-drying; evaporation, pressure and vacuum filtration, mixing, extraction, comminution, sieving, thickening and other handling of solids and slurries in bulk; instrumentation for the determination of particle size by sieving, microsieving, gravimetric and X-ray sedimentation and sedimentation under high g's, as well as for the measurement of BET surface area, pore size distribution, permeability, differential thermal analysis and thermogravimetric analysis; equipment for the determination of thermal conductance; laser-Doppler, ultrasonic and other velocity probes; gradientless reactors; gas and liquid chromatographs; mass spectrometer for compound identification; low and high frequency data acquisition systems, including one for multi-point electrochemical

mass transfer investigations; computing facilities including desk top computers, display, fast and slow printing terminals giving access to the CSIR's CYBER 174 and IBM 370 computers and overseas data banks.

Air Pollution; Emission Measurements:	Mr D Heinichen	X 2361, 2356
Catalysis/Catalyst Preparation:	Dr M S Scurrell	X 2387, 2356
Fluid Dynamics and Heat Transfer:	Dr R E Hicks	X 2361, 2356
Instrumentation:	Mr J H Seegers	X 3667, 2356
Particle Technology:	Vacant	X 3663, 2356
Process Development:	Mr D Heinichen	X 2360, 2356
Properties of Fluids:	Dr R E Hicks	X 2361, 2356
Reactor Technology:	Vacant	X 3677, 2356
Services to Industry:	Mr D Heinichen	X 2360, 2356
Toxicity of Chemicals:	Mr RW Wilkinson	X 2386, 2356
Drying:	Mr P G Kribbe	X 2364, 2356

FOUNDATION FOR RESEARCH DEVELOPMENT (FRD)

Scientia, Pretoria
P O Box 395, Pretoria, 0001

Telephone: National (012) 86-9211
International: + 27 12 86-9211
Telegrams: NAVORSPRO, Pretoria
Telex: 3-21312SA

Head:	Dr R R Arndt	X 3762
Liaison & Information:	Mrs A J van Vuuren	X 4279
Main Research Support Programme and Stimulation Programmes:	Dr R R Arndt	X 3762

Managers, National Programmes:		
Environmental Sciences and Aquaculture:	Mr B J Huntley	X 3731, 4354
Energy Research and Microelectronics:	Dr G P N Venter	X 3926
Materials and Biotechnology:	Dr R G Noble	X 2071
Oceanographic Research, Geoscience, Antarctic Research, Remote Sensing and Weather, Climate and Atmosphere Research:	Mr O A van der Westhuyseri	X 2072, 3812
Administration:		
Manager:	Mr W J Weideman	X 2435
Finances & General Administration:	Miss D J Scheepers	X 3939, 2394
Main Research Support Programme:	Mr J A Botha	X 2433
Total staff:	108	
Budget 1985:	R32 000 000	

Introduction

Functions: The Foundation, which was formed in April 1984 to combine the functions of the former Cooperative Scientific Programmes (CSP) and the Research Grants Division (RGD), is responsible for the development of research programmes in the natural and applied sciences in South Africa.

The Main Research Support Programme (previously RGD) manages the earmarked funds provided by the State to support research at universities and museums. The CSIR was first entrusted with this legal responsibility in 1946. These funds are awarded to postgraduate students and established researchers on the basis of individual merit by the Main Research Support Programme's Advisory Committee and its various specialist subcommittees. A similar programme aimed at research at technikons, has recently been launched.

The National Programmes (previously CSP) aim to solve well-defined national problems through cooperative research. The set goal of the proposed research and the quality of the research team are relevant criteria. The National Programmes were established to coordinate efforts, mobilize the best expertise available to undertake research into complex interdisciplinary and multi-institutional problems of national and international importance unlikely to be solved by organizations working in isolation. Earlier programmes arose from participation in global ventures of the International Council of Scientific Unions (ICSU), of which several still continue whereas later programmes mainly focussed on national needs. The coordinators collaborate with scientists and managers at statutory organizations, universities, government departments and the private sector for the planning, harmonizing and development of these programmes. Stimulation Support Programmes will be initiated in order to encourage research in favoured fields which have been identified.

THE MAIN RESEARCH SUPPORT PROGRAMME

Promotes research and the training of research students at universities, museums by awarding research grants to members on the permanent staff of these institutions as well as bursaries for postgraduate study at universities. Research is supported in the fields of the natural sciences and engineering. In borderline cases where it is not clear whether the research falls within the natural, medical, human or directed agricultural sciences, other grant-giving bodies will be consulted in order to determine the appropriate support for the proposed research.

Grants are awarded on the basis of proven individual research merit. Comprehensive support is given to researchers of the highest merit and may be in the form of manpower, studentships, travel allowances, operational funds and equipment; partial support is given to researchers of the required merit but who do not qualify for comprehensive support; *ad hoc* support may take the form of support for the attendance of international scientific conferences, short-term visits abroad, sabbatical support grants, guaranteed tenure as well as visiting fellowships, and contributions to costs of short visits by overseas scientists; the purchase of expensive equipment may also be supported.

Selection committees in the fields of animal science, biochemistry, chemistry, earth science, engineering, mathematics and computer science, microbiology, museum science, physics, plant science and statistics, report to the Advisory Committee for recommendation to the Council.

The status of Director of a CSIR Research Centre/Unit was awarded to:

Prof. J P F Sellschop, University of the Witwatersrand/CSIR/Schonland Research Centre for Nuclear Sciences

Prof. C von Holt, University of Cape Town/CSIR/Research Centre for Molecular Biology

Prof. R J Haines, University of Natal/CSIR/Research Unit of Metal Cluster Chemistry

Prof. J B Martin, University of Cape Town/CSIR/Applied Mechanics Research Unit

Prof. D G Roux, University of the Orange Free State/CSIR Flavanoid Chemistry Research Unit

Prof. P H Stoker, Potchefstroom University for CHE/CSIR/Cosmic Rays Research Unit

Prof. D R Woods, University of Cape Town/CSIR/Microbial Genetics Research Unit

Prof. C F Cresswell, University of the Witwatersrand/CSIR Photosynthetic Nitrogen Metabolism Research Unit

Dr M K Seely, Transvaal Museum/CSIR Desert Ecological Research Unit

Prof. J G H du Preez, University of Port Elizabeth/CSIR Uranium Chemistry Research Unit

Prof. J van Staden, University of Natal/CSIR Plant Growth and Development Research Unit

THE NATIONAL PROGRAMMES:

ECOSYSTEMS PROGRAMMES

Manager: Mr B J Huntley X 3731

NATIONAL PROGRAMME FOR ECOSYSTEM RESEARCH (NPECR)

Initiated 1972 to stimulate and coordinate research on questions concerning selected environmental problems of national, regional or global importance in natural or semi-natural systems within the biosphere; research on aquatic and terrestrian ecosystems and their soil and water substrata.
Administered by the National Committee for Ecosystem Research (Chairman: Mr J P de Wit, Deputy President, CSIR). South African member of ICSU's Scientific Committee on Problems of the Environment (SCOPE).
Funding: CSIR, Department of Environment Affairs, Water Research Commission (Inland Water Ecosystems), provincial administrations.

Inland Water Ecosystems

Coordinator: Dr R D Walmsley X 4219

Investigations into the problems associated with water and multiple use of water bodies.
Environmental impact studies: Implications of future development within catchment areas and planning regions; ways of keeping impacts to a minimum; identifying research needs.
Eutrophication in Hartbeespoort Dam: Influence of eutrophication on its ecosystem; cycling of nitrogen and phosphorus; predicting the consequences of planned development in the catchment area; possible management actions; rehabilitation of eutrophic impoundments.
Eutrophication in the Mgeni system: Testing of models in the Midmar Dam to predict algae growth as a function of phosphate loading; prediction of the consequences of planned development in the catchment area.
Wilderness lakes: Impact of construction works, intended development and management measures such as weed control, and the opening and closing of the mouth of the Touws River floodplain on these lakes.
Wetlands: Compilation of a bibliography and guide to wetlands in Africa.
Pongola River floodplain: Investigation of flood regulation control on the general ecology of the floodplain, with special reference to human resource needs.
Lower Vaal River: Investigation of water quality problems.

Terrestrial Ecosystems

Coordinators: Mr B J Huntley — X 3731
Mrs M Jarman — Tel. (021) 69-8531 x 627

Development of an understanding of the nature and functioning of representative ecosystem types in order to make it possible to predict the consequences of planned management actions; and the search for solutions to specific problems such as invasive plants, fire, soil erosion, pesticide residues; and the gathering of information which will throw light on such problems.
Karoo biome: Synthesis of available information on ecosystem functioning, processes of accelerated veld deterioration, soil erosion and desert encroachment; arid land management and rehabilitation.
Fynbos biome: Examination of plant nutrient requirements, water relations and the effects of fire and invasive plants; the status of threatened species.
Savanna ecosystem: Integrated study of a savanna ecosystem at Nylsvley; ecosystem processes controlling stability or leading to deterioration of veld productivity; soil nutrition, water relations and the effects of fire, grazing and invasive plants.
Grassland biome: Synthesis of available information on ecosystem processes and environmental problems; vegetation monitoring, mapping and classification; water relations.
Fire ecology: Ecological effects of fire in South Africa (SCOPE project).
Land transformation: Processes causing deterioration and other changes; definition of parameters for the quantification of land transformation and evaluation criteria (SCOPE project).
Forest biome: Distribution and conservation of indigenous forests; compilation of a structural functional classification system for South African forests.

Nature Conservation Research

Coordinator: Mr A A Ferrar — X 3364

Development of ecological principles and practices for the conservation of indigenous species and communities together with their habitats and life support processes.
Habitat and species conservation: Determination of scientific criteria; conducting appropriate research and surveys to facilitate the classification and conservation of threatened habitats and species at a national level; compilation of *Red Data Books* listing rare and endangered species.
Management and utilization of wildlife: Principles and practical guidelines for managing the habitats of wildlife species of natural areas, particularly for their long-term use.
Conservation behaviour: Aspects of human behaviour affecting or arising from man's interaction with the natural environment; improvement of individual motivation for the conservation of environmental resources.
Invasive biota: The nature and extent of invasions by alien species and their effects on natural ecosystems; characteristics of the more successful invading species to facilitate their control; intercontinental comparative work to explore the global mechanisms of biotic invasions, and the entire ecology of the phenomenon.
South African Bird Ringing Unit (SAFRING): A service and monitoring facility to coordinate, analyze and publish the collection of bird ringing data on a continuous basis.

AQUACULTURE PROGRAMME

Coordinator: Dr R D Walmsley X 4219

Initiated 1983 to study the human-controlled cultivation and harvest of aquatic organisms for commercial utilization as well as proper management of natural systems by optimal input of feed and energy to provide higher yields; to provide scientific information to users, including commercial producers, agricultural authorities, farmers, the marine industry and agencies involved in economic planning and development.
Administered by the Committee for Aquaculture Research (Chairman: Mr JP de Wit, Deputy President, CSIR)
Funding: CSIR.

Existing commercial aquaculture: Provision of scientific information for the trout and oyster industries aimed at better utilization of resources; propagation of ova and seed on demand, and adaptation to local conditions by genetic selection; increased yields; lower production cost through optimization of feed and market expansion by diversification of products.
Production of species: Provision of scientific information on species like freshwater prawns, marine prawns, Australian freshwater crayfish, abalones, mussels, turbots and dover soles in order to replace imports and promote export; propagation and selection of local breeding stock; nutrition studies; optimal feed preparation; disease control; management and optimization of production systems; adaptation of available technology to local conditions.
Integration of aquaculture into existing activities such as agriculture, recycled waste and thermal effluents; propagation of all-male tilapia populations for better growth; study of factors affecting the survival of catfish larval stages; influence of environmental factors on production; nutrition studies; the relationship between stocking density, feed conversion ratios and production cost; processing of products and market research; optimal utilization of agriculture/aquaculture systems.

ENERGY PROGRAMMES

Manager: Dr G P N Venter X 3926

NATIONAL PROGRAMME FOR ENERGY RESEARCH (NPER)

Initiated 1978 to optimize the utilization of energy in South Africa, taking conservation aspects and environmental impact into account. The South African Energy Information System (SAEIS), which is part of the Programme, was established in 1984 and is managed by the National Institute for Informatics, to ensure optimal use of, and provide liaison between existing information services in South Africa. A broad modelling action has been initiated. Assistance is given to the National Committee for Energy Research (NCER) to identify possible future energy needs, to establish priorities for energy research and to serve as an aid in the decision-making process.
Guided by the National Committee for Energy Research (Chairman: Dr C F Garbers, President, CSIR), assisted by the National Committee for Coal Research and the Divisional Committees for Energy in Transportation and Alternative Technologies.
Funding: CSIR, Department of Mineral and Energy Affairs.

Energy in Transportation

Coordinator: Dr R B Anderson X 3962

The use of alternative fuels manufactured locally; alternative means of transport to those requiring liquid fuels (e.g. electric vehicles and other electrified systems); fuel conservation measures to reduce the country's dependence on external oil supplies.
Electric vehicles: Development of efficient variable speed drives to optimize the limited energy capacity of existing lead-acid batteries at minimum cost; demonstration and assessment of on-the-road electric vehicles; feasibility studies on electric vehicle traction.
Alternative fuels: Assessment of the suitability of various 'light' diesels from the oil refineries and from SASOL for use in various types of diesel engines; alcohol blends with diesel, and methanol with additives as possible alternatives.
Optimization and utilization of transport fuel usage: Investigations into traffic conditions and regulations, roads and road surfaces, vehicles and driving characteristics in order to promote efficient fuel utilization and acceptable conservation measures and techniques.

Coal Research

Coordinator: Mr D L W Krueger X 2597

Optimization of the utilization of coal as a primary source of energy, raw material in the chemical industry, reducing agent in the metallurgical industry and as export mineral.
Improved Exploration of Coal: Methods of optimizing existing and developing new mining techniques for coal; research on geological formations including sedimentology, faults, dykes and their effects; improvement of mining methods to increase extractability.
Beneficiation: Physical and chemical upgrading of particularly the fine fraction of coal (minus 0,5 mm); briquetting for fines utilization.
Combustion: Development of fluidized bed combustion and gasification of coals; cogeneration; spontaneous combustion.
Conversion of coal to solid, liquid and gaseous products for energy generation and as feedstock to the chemical industry.
Characterization and Classification: Mineralogy, petrography, physical and chemical properties; type and characteristics for various uses of coal; analitical and sampling techniques.

Alternative Technology

Coordinator: Mr J A Basson X 4282

Development of new and renewable energy sources and technologies for application in First and Third World countries.
Load and Energy Conservation: Study of the load side of the energy equation and techniques of reducing it; investigations of heat pumps, Stirling engines, wind, tidal and geothermal energy; attention to socio-economic factors.
Solar Energy: Thermal solar energy for heating and cooling of buildings and applications in rural and agricultural communities; use of photovoltaics for small-scale power supply in remote locations, or large-scale for economic or strategic reasons.

Bio-energy: Production and utilization of biomass for energy production by means of combustion, gasification and fermentation.
Appropriate Technology. Development of technologies for agricultural, home industry and rural situations with reference to local climate, complexity, cost, availability of local skills and materials.
Energy Storage systems where supply and demand are out of phase or where the supply is deliberately moved out of phase with demand in order to reduce peak loads.

Energy Systems and Modelling

Coordinator: Dr G P N Venter X 3926

Provides support in the form of information and the formulation of research priorities for energy research in general.

NATIONAL R&D PROGRAMME FOR MICROELECTRONICS

Coordinator: Mr M Crooke X 4277

Initiated 1983 to develop a national R&D strategy for South Africa prepared and supported by Government to create a favourable environment for supporting a reasonable level of local self-sufficiency and innovation in microelectronics.
Administered by the CSIR's National R&D Committee for Microelectronics (Chairman: Dr J B Clark, Deputy President, CSIR).
Funding: CSIR.

Design of integrated circuits
Strengthening R&D expertise in integrated circuit design; establishment of adequate facilities; promotion of design awareness and capability amongst manufacturers of electronic equipment in South Africa.

Electronic Devices
Encouragement of an understanding of the technology of specific devices and their application in electronic systems; investigation of their properties and behaviour through local prototype development and characterization.

Critical process steps and related materials
Identification of areas for R&D support; attention to problems related to local manufacturing capabilities; stimulation of sound appreciation of new areas in advance of local requirements.

Failure analysis
Analysis of product failure and determination of the failure mechanisms; stimulation of activity in semiconductor failure analysis; creation of a reservoir of expertise amongst physicists, chemists and electronic engineers.

MATERIALS AND BIOTECHNOLOGY PROGRAMMES

Manager: **Dr R G Noble** **X 3807,2071**

NATIONAL RESEARCH PROGRAMME FOR RENEWABLE FEEDSTOCKS

Coordinator: **Dr J C Paterson-Jones** **Tel. (021) 69-8531 x 860**

Initiated 1979 as a section of the National Programme for Materials Science and Engineering for the exploitation of hitherto neglected or underutilized resources; to mobilize multidisciplinary teams to execute cost-effective interdisciplinary programmes of national interest to develop chemical feedstocks, protein and other products from renewable resources such as plants; to stimulate research and training in these fields.
Administered by the National Research Committee for Renewable Feedstocks
Funding: CSIR, with contributions from industry.

Biological utilization of bagasse: breaking of the lignocellulose molecule in waste bagasse; appropriate pretreatment and enzymes for saccharification and isomerization of xylose to xylulose; fermentation of C5 and other sugars derived from hemicelluloses to glucose and single-cell protein; testing and commercial feasibility studies of the process.
Guayule: Horticulture and development of guayule as a local source of natural rubber providing a crop for marginal agricultural areas; development of rubber and byproducts such as resins; investigation of the possible improvement of seed propagation techniques in order to increase yields and improve the economics; field trials.

NATIONAL RESEARCH PROGRAMME FOR WASTE MANAGEMENT

Coordinators: **Mr J J Malan** **X 3636**
Dr R A Kruger **X 3982**

Initiated 1979 as a section of the National Programme for Materials Science and Engineering to identify and address wastes management problems of national interest and to mobilize teams to undertake the research required to solve these problems, for instance for the development of technology for the handling, disposal and utilization of wastes in order to reduce environmental problems and to conserve resources.
Administered by the National Research Committee for Waste Management (Chairman: Mr N A Lever).
Funding, Department of Environment Affairs, CSIR, Department of Mineral and Energy Affairs.

Urban wastes: Investigation of potential for the utilization and the regional disposal of wastes; leachates production and interaction between leachates and liners in disposal sites.
Chemical wastes: Study of industrial and other wastes with specific chemical composition posing specific problems; amelioration or rehabilitation of degenerate or acidic soils by using waste phosphogypsum as a conditioner establishing the influence of phosphate release mechanisms within phosphogypsum on setting times of cement; enviromental impacts of phosphogypsum dumps and its re-use;

investigation into protein production from abattoir and food processing industry wastes; sterilizing techniques; production of single-cell proteins; study of hazardous and toxic wastes and environmental consequences of their handling, transport and disposal.
Pulverized fuel ash (PFA) and mining wastes: The use of PFA as an additive to cement and concrete in the building industry, as a filler in brick and tile production, as a soil ameliorant in agriculture and as a primary source of alumina and other strategic commodities; backfilling of coal mines with PFA in order to improve extraction efficiency; study of environmental aspects. -technology required for the safe surface disposal of mining wastes.

BIOTECHNOLOGY TRAINING PROGRAMME

Coordinator: Dr R G Noble X 3807, 2071

Initiated 1983 for high-level training of researchers in specific fields of importance for the future development of biotechnology in South Africa. Research fellowships are made available and researchers are sent overseas on short intensive training courses if local expertise is not available.
Administered by the Biotechnology Training Programme Steering Committee (Chairman: Prof. W Gevers, Department of Medical Biochemistry, University of Cape Town).
Funding: CSIR.

Vaccines: Training in techniques for vaccine production by modern recombinant DNA techniques for combating animal and human diseases caused by geographically unique microbial taxa.
Genetic manipulation of micro-organisms: Training in cloning, amplification and transfer of genes of aerobic and anaerobic bacteria.
Genetic manipulation of plants: Training in protoplast isolation, culture; selection, virus elimination and mass propagation.
Genetic manipulation of non-plant eukaryotes and animal cells: Training in liposome technology, protein sequencing and culture techniques for eukaryotic cells.

MATERIALS SCIENCE AND ENGINEERING STIMULATION PROGRAMME

Coordinator: Mr R A Pacey X 3904

To be initiated 1985 to promote and accelerate research and advanced training in the disciplines expected to be essential for the development of materials science and engineering in the coming decade.

MARINE AND EARTH SCIENCE PROGRAMMES

Manager: Mr O A van der Westhuysen X 2072

COOPERATIVE NATIONAL OCEANOGRAPHIC RESEARCH PROGRAMME (SANCOR)

Coordinators: Mr O A van der Westhuysen X 2072
Mr D van der Zee X 3764

Initiated 1963 to gain knowledge of the basic structures, processes and relationships in the marine environment around southern Africa in order to provide a fundamental scientific understanding and to facilitate the efficient exploration, exploitation and conservation of living and non-living resources; to manage the coastal zone; to study climate; to improve utilization of environmental information in maritime activities; to represent South Africa in the activities of non-governmental international oceanographic organizations, particularly in ICSU's Scientific Committee on Oceanic Research (SCOR).
Administered by the South African National Committee for Oceanographic Research (SANCOR) (Chairman: Dr G Heymann, Deputy President, CSIR).
Funding: CSIR, Department of Environment Affairs, Department of Transport.

Benguela ecology
Structure and functioning of constituent ecosystems for the management of renewable natural resources; ecological research in subtidal and pelagic environments.
Primary production, mineralization and nutrient cycling: Physical factors associated with upwelling and subsequent transport of enriched water; biological factors influencing growth and decay of macrophytes and phytoplankton.
Major trophic pathways to selected consumers: Main food chains; energy of food-transfer; energy losses at different trophic levels; the system's carrying capacity, influence of predators; potential yield of commercially important fish populations.
Fluctuations in recruitment and population structure of selected species: Monitoring changes in size and distribution of populations, the effect of variation on other species; recruitment; natural mortality.
Systems analysis of component ecosystems: Habitats. Inshore: rock-lobsters, seaweeds and abalones; Offshore: anchovies, pilchards and predators.
Coastal processes
Key processes controlling factors and mechanisms in coastal zones; for development, management and conservation.
Physical processes: Wave-related nearshore phenomena; present-day sediment sources/transport/deposition; tides, wave climate, coastal wind field/front/currents and geological control.
Chemical processes: Input: chemical elements and compounds; decaying detrital matter and atmosphere; processes within zone. Output: advection of soluble suspended matter.
Biological processes: Biological interactions between plants and animals; predators and prey and competitive and symbiotic interactions; physiological processes; behaviour; life cycles.
Estuaries
Scientific study of selected estuaries to improve their management.
Physico-chemical structure: Hydraulic behaviour; chemical investigations; physical, biological and biochemical processes in water column; macrophyte beds and superficial and buried sediments; geology and sediment dynamics.
Biological structure: Processes regulating the abundance and diversity of organisms.
Impact of man: Effects of damming of rivers, dredging, erosion, pollution, canalization, opening of river mouths and other forms of engineering works; development of techniques to evaluate optimal use.
River catchments: Magnitude and rates of environmental changes in river catchments and their effect upon the quantity and quality of river inflows to the estuary.

Restoration: Appropriate techniques for restoration of selected estuaries.

Marine pollution

Influences of discharges into the sea, particularly of interactive physical, chemical and biological processes as well as human impact, to provide information for the management of coastal resources.

Monitoring: Inshore and offshore long-term routine and biological monitoring programme.

Site specific surveys: Physical, chemical and biological surveys of areas to predict effects of planned discharges.

Discharges: Effects of pollution on ecosystems and resources and their measurement.

Effects of pollutants: Sublethal testing systems; species composition and community structure; laboratory simulation.

Concept of assimilative capacity: Levels of stress on ecosystem can absorb without causing irreversible changes.

Water quality criteria: The upper limits not to be exceded to maintain specific use of that water.

Oil pollution research: Detailed and specific information required to determine the effects of oil and oil dispersants in the marine environment; reduced effects by limiting quantities of oil spilled; quantity of oil reaching the coast and by reducing the effects of oil reaching the coast.

Contingency plans: Scientific advice to the Department of Transport for the development of effective contingency plans.

Protection of estuaries and coastal clean-up: Effectiveness of oil booms and booms manufactured from materials of opportunity; effective storing and disposal of cleaned-up oil; aerial application of dispersants.

Protection and cleaning of birds: More effective and faster methods of bird collection and cleaning.

Coastal sensitivity and oil movement: Scientific information on coastal sensitivity and the potential danger of oil pollution to the South African coast.

Marine linefish

Scientific information on the marine food web to marine linefisheries to promote effective management strategies (currently directed at angling fish caught in estuaries, rock, surf and open sea environments along different parts of the coast); biological research; analysis of catch statistics; determination of trends in the fishing for individual species.

Marine sedimentology

Study of marine sedimentary processes and products.

Pelagic sediments: Late Quaternary studies; microplankton studies on shelf-to-basin sediment sample profiles.

Margin to basin sediments: Shelf sediment lithofacies in relation to physical, chemical and biological processes in water columns and on the sea bed; slope, rise and ocean basin lithofacies in relation to physical processes and pelagic productivity; distribution of ancient and modern large-scale translational and erosion features on continental slope and rise; acoustic stratigraphy.

Authigenic mineral and other geochemical studies: Analyses of phosphorite rocks; relationship of water column productivity to trace metal and authigenic mineral production in e.g. the Walvis Bay area; pore water and interparticle geochemistry of modern sediments in margin to ocean bay traverses.

NATIONAL GEOSCIENCE PROGRAMME (NGP)

Coordinator: Dr L E Wolhuter X 3725

Initiated 1981 to study principles and processes whereby elements concentrate in the earth's crust to form ore deposits; to develop conceptual models of ore genesis to assist in the search for new mineral deposits, *The Evolution of Earth Resource Systems* being the main theme.
Administered by the South African Committee for the International Union of Geological Sciences (SACUGS) (Chairman: Dr C F Garbers, President, CSIR).
Funding: CSIR, Geological Survey, Department of Mineral and Energy Affairs, Rio Tinto.

Coal geology (in collaboration with Energy Programme)
Sedimentological and lithostratigraphic study of permain coal measures to reconstruct the palaeo-environment of peat accumulation; geochemical investigation of coal to determine imprint caused by the method of formation and the sources of its inorganic constituents.

Mineralization of the Griqualand-West and Transvaal sequences
Early Proterozoic iron and manganese deposits; fluorite, lead and zinc mineralization in the carbonate rocks; gold deposits in the Eastern Transvaal.

Sulphide mineralization in the North-West Cape
Stratabound or strata-controlled sulphide mineralization associated with rocks of the Mid-Proterozoic Namaqua Metamorphic Complex; nature and origin of host rocks and sulphides and their behaviour during metamorphism and deformation.

Relationship between mineralization and craton-forming processes in granite-greenstone terranes of the Kaapvaal craton
Demonstrating the relationship of ore-generating systems to tectonic metamorphic and other processes active during Archaean craton formation.

Controls of mineralization within layered plutonic complexes
Study of the processes which led to the concentration of ores within the Bushveld Complex and other layered complexes.

Exploration techniques
Development of geophysical and geochemical techniques to locate hidden ore-bodies.

Tectonic framework of mineral deposits in South Africa
Development of models to interrelate major tectonic episodes, metallogenesis and the structural framework of the country; publishing this information on an appropriate set of maps.

SOUTH AFRICAN NATIONAL ANTARCTIC RESEARCH PROGRAMME

Coordinator: Dr P R Condy X 3726

Initiated 1960 to advise the Government on, and coordinate the scientific component of South Africa's Antarctic effort; to advise the Department of Transport on the allocation of funds and when necessary to provide the scientific

expertise in Antarctic Treaty negotiating delegations; to represent South Africa on the ICSU Scientific Committee on Antarctic Research (SCAR); to undertake research at SANAE and in western Queen Maud Land, Antarctica, the Prince Edward Islands, Gough Island of the Southern Ocean off the *SA Agulhas*.
Administered by the Department of Transport and advised by the South African Scientific Committee for Antarctic Research (SASCAR)
(Chairman: Dr G Heymann, Deputy President, CSIR).
Funding: Department of Transport, Department of Public Works and Land Affairs, CSIR.

Biological sciences
Study of the structure and functioning of selected communities and populations and their interaction with local terrestrial, freshwater and marine ecosystems at the Prince Edward and Gough islands.

Earth sciences
Understanding the geology of Western Queen Maud Land, Antarctica, the processes involved in contental drift; manner in which Gondwana Supercontinent broke up.

Upper atmosphere science
Study of the immediate spatial environment of the earth, in particular the complex interactions of solar radiation with the upper atmosphere and the magnetic field of the earth.

Oceanographic sciences
Understanding the physical, chemical and biological processes which influence the structure, functioning and living resources of the Southern Ocean.

NATIONAL PROGRAMME FOR REMOTE SENSING (NPRS)

Acting Coordinator: Dr C W Louw X 3895

Initiated 1975 to support goal-directed cooperative R&D projects for studying phenomena, resources and problems important to South Africa with the aid of remotely sensed data and related techniques.
Administered by the National Committee for Remote Sensing (Chairman: Dr G Heymann, Deputy President, CSIR).
Funding: CSIR.

Land Cover
Agricultural crops: Identification and mapping; fundamental investigations of the temporal and spectral characteristics of crops from Landsat imagery.
Forest studies: mapping indigenous and exotic forests on scales useful for macro planning purposes.
Natural vegetation: Its mapping, study of veld fires, water quality observations in large dams; rural land use investigation in support of soils mapping operations.
Landcover: mapping in various regions of importance.
Geosciences
Rock-type discrimination and detection of linears and fractures; seasonal differences and their role in the usefulness of LANDSAT imagery for geological interpretation; evaluation of high-resolution multispectral and radar imagery in geoscience applications.

Data acquisition, processing and display
Technique-orientated projects: image processing; algorithm development; geocoding of satellite-derived and other information; geometric correction of imagery; use of digitized aerial photography.

NATIONAL PROGRAMME FOR WEATHER, CLIMATE AND ATMOSPHERE RESEARCH (NPWCAR)

Coordinator: Dr C W Louw X 3895

Initiated 1981 to support basic and applied goal-oriented research on the southern African subcontinent and its adjacent oceans in four key areas, in harmony with guidelines laid down by the World Climate Programme.
Administered by the National Committee for Weather, Climate and Atmosphere Research (Chairman: Dr G Heymann, Deputy President, CSIR).
Funding: CSIR, Department of Environment Affairs, Department of Health and Welfare.

Weather and climate research
Basic study of weather and climatic systems including atmospheric processes underlying dispersion, in order to develop models and to improve short and long range predictions of weather, atmosphere states and climate.
Climate variability and change: Study of the descriptive and causal aspects of weather/climate systems, related to cloudiness and radiation, ocean processes, and hydrology and land surface processes, with the purpose of modelling climate in the RSA.
Synoptic and dynamic meteorology: Study of synoptic weather systems and related atmospheric processes to improve weather forecasting on all time scales.
Ocean climatology: Observation of long-term trends in the kinematics and dynamics of the oceans adjacent to the southern African subcontinent and their influence on climatic changes.
Mesometeorology and -climatology: Study of the physics and dynamics of the atmosphere on meso- and microscales in order to develop a predictive aid for the planning of important regions.
Agrometeorology and -climatology: Determination of the relationships between weather/climatic elements and agriculture/forestry/vegetation for the management of agricultural land and water resources in given areas as well as for prediction purposes.
Hail and thunderstorm climatology: study of precipitation and electrification mechanisms and their effects.
Weather modification: study of processes occurring in convective clouds; examination of hail suppression and rainfall augmentation techniques.
Urban meteorology and climatology: study of the processes governing anthropogenic climatic changes; atmospheric dispersion fields over cities; and modification of the urban boundary layer.
Palaeoclimatology: Preconstructions of past climates to predict future climates focussing on arid and wet zones in southern Africa during the Quaternary geological period with emphasis on the past 1 000 years.
Solar-terrestrial weather/climate relationships: study of the sun's effect on terrestrial weather; the role of the middle atmosphere in determining terrestrial climate and climatic changes.

Atmospheric interaction
Study of the impacts of climate and human activities on the environment as well as their interactive relationships.
Methodology of climate impact assessment: Development of suitable methods for accurate quantification of risks and consequences of climate phenomena.
Influence of climate on man and his environment: Techniques and/or models to describe climate environmental relationships.
Influence of man's activity on climate and the environment: Determination of the influence of man-made atmospheric pollutants on climate and environment.

Data and information requirements
Promotion of data collection, archiving and dissemination of information to meet research and application requirements; compilation of a national register for weather, climate and atmosphere numeric data sources.

Education and training
Promotion of education and training of meteorologists, climatologists, data processing specialists, etc.

INFORMATION AND RESEARCH SERVICES (IRS)

Scientia, Pretoria
P O Box 395, Pretoria, 0001

Telephone: National (012) 86-9211
International + 27 12 86-9211
Telegrams: NAVORSLIG, Pretoria
Telex: 3-21287

Chief Director:	Dr L R P Butler	X 2755
Director:	Dr J P Reinhardt	X 2055
Deputy Director:	Dr J A Brink	X 2078
Total staff:	144 posts	

Functions: To act as the main liaison centre of the CSIR; to provide information and act in a support capacity to the Office of the President of the CSIR; to promote technological research and development and its implementation in industry; to provide techno-economic services to other institutes of the CSIR, the public service and the private sector; to publicize and promote the work of the CSIR through publishing, publicity and communication systems; to promote contact between scientific and industrial communities by arranging conferences, symposia, visits to the CSIR and exhibitions; and to represent South African science and technology internationally and administer international scientific agreements.

GROUP FOR TECHNO-ECONOMIC STUDIES

Group Head:	Dr J P Reinhardt	X 2055

The Group assists the Office of the President as well as other organizations by undertaking studies in support of science policy formulation, research management and strategic planning. For the stimulation of technological

innovation in industry the Group provides techno-economic information on the chemical and pharmaceutical industries, metals and metal products, and biological resources; collaborates with other organizations in the setting up of data banks on electronics and microelectronics; and administrates the CSIR industrial research fellowship scheme aimed at promoting research by industry in industry.

Research Economics

Head: Mr H P Hofmeyr X 2084

Studies related to the management of R & D and technological innovation; provision of data and information on science policy and research management; statistical analyses of R & D expenditure and manpower; compilation of comprehensive *National Register of Research Projects*.

Chemicals and Pharmaceuticals

Head: Mr J J Hough X 2853

Identifies key technologies within the country's chemical and pharmaceutical industries; provides a techno-economic input to the development of the local chemical and pharmaceutical industries by means of industrial and market surveys which are also undertaken on contract.

Metals and Metal Products and Electronics

Head: Mr M D White X 2070

Provides services similar to those outlined under the previous heading for the metals and metal products industries; is building a data bank with technical and economic information on electronic systems to enable close collaboration with the electronics industry in South Africa.

Biological Resources

Head: Mr G F Minnaar X 2216

Provides services similar to those outlined under the Chemicals and Pharmaceuticals Division for products of biological origin - industrial sectors served are mainly the food, sweetener, fibre and leather industries; aquaculture, waste recycling, biotechnology and the promotion of contact between the various industrial sectors and appropriate institutes of the CSIR.

Data Division

Head: Mr S F van der Westhuizen X 2081

Maintains an integrated and computerized information and data system to cater for the information needs of the research staff in the Group specializing in data selection, storage, analysis and retrieval with the emphasis on foreign trade, local production, technology, etc., related to the specialist industrial sectors of chemicals, pharmaceuticals, metals and metal products, biological products and electronic components.

INTERNATIONAL RELATIONS

International Relations Division

Head: Dr J A Brink X 2078, 2095

Discharges responsibilities arising out of the CSIR's membership of non-governmental international scientific organizations and matters relating to international scientific cooperation.

South African Scientific Liaison Offices Abroad

As the CSIR has the statutory responsibility for representing South African science and technology internationally it maintains, at present, five Liaison Offices attached to the South African diplomatic missions in Washington, Los Angeles, London, Bonn and Paris.

These offices promote the exchange of scientific and technical information between South African scientists and scientific organizations and their counterparts elsewhere, *inter alia*, by attending conferences and meetings and arranging itineraries for South African scientists travelling abroad. They also assist in the recruitment of scientific and technical staff for the CSIR, universities and other research organizations.

LIAISON OFFICES ABROAD

WASHINGTON: Head Mr C G Hide,
South African Embassy,
Suite 350, 4801 Massachusetts Avenue
N.W., Washington, D.C. 20016, USA
Telephone: (202) 362-8805
Telex: 248401
Telegrams: SASCIENCE Wasington, D.C.

LONDON: Head: Mr NC Hauffe,
South Afrocam Science Office,
Chichester House, 278 High Holborn,
London WCIV 7HE, England, UK
Telephone: (1) 242-1766
Telex: 27275
Telegrams: NAVORS London

PARIS: Head: Mr PJ van der Westhuizen,
South African Embassy,
59, quai d'Orsay, 75007 Paris,
France, (Postal address)
(3rd Floor, 97 Boulevard Haussmann, 75008 Paris, France)
Telephone: (1) 268-1121
Telex: 643452
Telegrams: NAVORS Paris

BONN: Head: Dr WJ van Biljon,
South African Embassy,
Auf der Hostert 3, 5300 Bonn 2,
Bundesrepublik Deutschland
Telephone: (228) 36-3047
Telex: 885762
Telegrams: SALEG Bonn-Bad Godesberg

CONFERENCE AND LIAISON GROUP

Head: Mr R K Newman X 2838

Symposium Secretariat

Head: Mrs A E Rhodes X 2077

Provides secretarial services and organizes symposia for CSIR institutes and other scientific and technical organizations on topics related to science and technology.

Liaison Division

Head: Mr R K Newman X 2838

Arranges functions and exhibitions for the CSIR and provides liaison and interpreting services to institutes of the CSIR as well as to other scientific and technical organizations.

Visitors' Division

Head: Mrs E R Oosthuysen X 2398, 3126, 4483, 4490

Maintains the CSIR reception office; arranges the itineraries of visitors from abroad and from South Africa, including visits to the CSIR and to other scientific and technical organizations in the Republic of South Africa; receives overseas visitors and arranges their itineraries in consultation with the International Relations Division.

Conference Centre Division

Head: Mr A M Kitter X 3824, 3809

Handles arrangements for the reservation of the CSIR Conference Centre and assists conference organizers and other users with the necessary facilities (including audiovisual services, interpreting equipment, etc.); handles arrangements for catering services; offers advice on poster sessions and exhibitions in the Centre.

PUBLISHING AND PUBLICITY

Publishing Division

Head: Mr P Pretorius X 4304

Provides publishing services and maintains publication standards mainly by giving editorial assistance and advice to authors and editors in the CSIR; produces various information publications on the CSIR as well as bibliographic guides to sources of scientific and technical information in South Africa including the *Annual Report of the CSIR*, *The CSIR - organization and activities*, *Scientific research organizations in South Africa*, *Scientific and technical societies in South Africa*, *CSIR publications* (a quarterly list of articles and reports published under the auspices of the CSIR) and *Calendar of scientific and technical meetings in South Africa*.

Publicity Division

Head: Mr G W B Stoop X 3643

Maintains liaison with the mass communication and technical media, issues news releases, prepares articles and radio scripts and carries out other assignments related to the popularization of science (including the production of films and other audiovisual presentations); produces the CSIR journal *Scientiae* and the weekly CSIR staff newspaper *Sciendaba*, and compiles special publicity matter as required.

Special Services Division

Head: Dr D F Louw X 3360

Coordinates the development and use of technical terminology within the CSIR in close cooperation with the Terminology Bureau of the Department of National Education and other interested bodies; carries out other special tasks assigned to it from time to time.

MAGNETIC OBSERVATORY (MO)

P O Box 32,
Hermanus, 7200

Telephone: National (02831) 2-1196, 7
International + 27 2831 2-1196, 7
Telegrams: NAVORS, Hermanus
Telex: 577819

Head: Dr G J Kühn
Deputy Head: Dr P R Sutcliffe
Total staff: 34
Research staff: 6

The Observatory was founded in 1932 as part of the South African contribution to the International Polar Year (1923-33). It functioned under the auspices of the University of Cape Town until 1937, and subsequently under the Trigonometrical Survey Office of the department of Lands until 1969 when it became a research unit of the CSIR.

Functions: Apart from the basic research work, which is mainly concerned with the study of magnetospheric substorm phenomena, the Observatory is for a significant part of its activities engaged in the routine accumulation of geophysical data as a service to research workers and other organizations both locally and overseas. The collected data find practical application in, for example, navigation by magnetic compass and geological exploration work.

Regular publications:
Annually: *Magnetic Observations at Hermanus; Magnetic Observations at Tsumeb; Magnetic Observations at Hartebeesthoek; Magnetic Observations at Sanae; Hermanus Neutron Monitor Data.*
Monthly: *Hermanus Magnetic Bulletin.*
Five yearly (approximately): *Geomagnetic Secular Variation in Southern Africa.*

Nature of routine work in Southern Africa:

Geomagnetism - Continuous monitoring of the geomagnetic elements at a network of recording stations (Hermanus, Tsumeb, Hartebeesthoek); maintenance of a network of about 65 permanent field stations for the determination of secular variation; magnetic surveys of the compilation of magnetic charts; maintenance of geomagnetic standards.
Cosmic rays - Continuous recording of variations in cosmic ray intensity at Hermanus since 1957 and at Tsumeb since December 1976 in collaboration with the Cosmic Ray Research Unit at Potchefstroom University.
Ionosphere - Monitoring of 30 MHz cosmic radio noise and 27 kHz atmospherics; operation of ionosondes at Hermanus and Tsumeb for the CSIR's National Institute for Telecommunications Research.

Special facilities: Standard magnetometers and magnetographs; facilities for calibrating magnetometers and compasses; bar flux meters for the recording of geomagnetic pulsations; NM-64 neutron monitors to record variations in cosmic ray intensity; 30 MHz riometer for the measurement of cosmic radio noise; VLF receivers to record sudden enhancements of atmospherics; meteorological equipment; computers for data reduction and analytical studies.

Nature of routine work in Antarctica:

Research work: Phenomena associated with magnetospheric substorms, in particular with studies of magnetic pulsations at low and high latitudes and proton aurora recorded at Sanae to establish their relation to the general pattern of substorm phenomena; studies of the magnetic Sq-variation, the magneto-telluric exploration method and the use of MAGSAT data for regional main field modelling and the derivation of crustal magnetic anomalies on a regional basis.
Geomagnetism - Continuous recording of the geomagnetic elements at the South African Antarctic base, Sanae, and regular geomagnetic secular variation observations at the Sub-Antarctic islands, Marion and Gough.
Aurora - All-sky photography and monitoring of the aurora at a wavelength of 486,1 nm for recording of proton aurorae.
The Antarctic Geomagnetism and Aurora Programme is administered by the Magnetic Observatory as an integral part of the activities of the Observatory. The programme is financed by the Department of Transport.

Special facilities: Standard magnetometers; Fluxgate and La Cour magnetographs; bar flux meters for the recording of magnetic pulsations, all-sky camera; tilting filter (486,1 nm) photometers.

NATIONAL ACCELERATOR CENTRE (NAC)

P O Box 72, Faure, 7131

Telephone: National (024) 4-3820
International + 27 24 4-3820
Telex: 57-22202

Chief Director: Dr D Reitmann X 2030
Institute Secretary: Mr F J van Lith X 2013
Total staff: 206

Functions: The Centre, which was established in April 1977 provides a multi-disciplinary accelerator facility for the use of all scientists in the country who are interested in research with and the application of accelerated beams of charged particles; provides service facilities for particle therapy and clinical trials in various treatment methods; and supplies accelerator-produced radioactive isotopes to users in nuclear medicine, research and industry.

Accelerator Group

Head: Dr A H Botha X 2011

Designs and constructs an accelerator facility consisting of a 200 MeV light ions as well as less intense beams of heavy ions. For experiments in nuclear physics, for example, and for proton radiography, 10 A beams of up to 200 MeV protons will be available. Proton beams with an intensity of 100 A and energy of up to 100 MeV will be available for isotope production and neutron therapy. The first beam is expected to be accelerated in 1985.

Research Group

Head: Dr S J Mills X 2012

Until the separated-sector cyclotron at Faure becomes operational, experimental nuclear physics research is being conducted on a regular basis at similar facilities abroad. Basic research is carried out on nuclear structure and nuclear reaction mechanisms at intermediate energy by studying charged particle reactions and scattering on a variety of nuclei. For this purpose light particles as well as heavy ions are utilized as projectiles. The experimental nuclear physicists of the Group are also involved in the planning of equipment and experiments for the future nuclear physics research programme around the Faure cyclotrons, in collaboration with working committees which have been formed by prospective users of the facility. In terms of the statutory responsibility of the CSIR, the Group maintains methods for the absolute standardization of radioactivity in South Africa, and continuously develops new and improved methods for such measurements. Standards of radioactivity are prepared on request. The Group will also be responsible for the future radioisotope production programme at Faure and is currently giving attention to the detailed planning of facilities and equipment needed for this programme.

Pretoria Cyclotron Group

Scientia, Pretoria
P O Box 395, Pretoria, 0001

Telephone: National (012) 86-9211
International + 27 12 86-9211

Head: Dr F J Haasbroek X 3320, 8/148

The Pretoria cyclotron is being utilized for the production of radioisotopes for medical and industrial applications, and fast neutrons for therapy.
A variety of radioisitopes, labelled compounds and radioactive sources are produced annually for use by local hospitals and non-medical users. Some long-lived radioisotopes are also exported in bulk. The routine production is supported by a research and development programme. Excitation curves are measured for charged particle reactions and various chemical and radiopharmaceutical studies are undertaken.

The new fast neutron facility jointly created by the CSIR and the Transvaal Provincial Administration will shortly be commissioned for therapy. In support of the therapy programme, physical and radiobiological studies are undertaken to establish the quality of the fast neutron beam.

Special facilities: 112 cm variable-energy cyclotron, accelerating protons, deuterons, helium-3 and helium-4; equipment for the production, handling and storage of radioactive sources; fast neutron facility.

Van de Graaff Group

P O Box 72, Faure, 7131

Telephone: National (024) 4-3500
International + 27 24 4-3500
Telex: 57-22202

Head: Dr W R McMurray

Previously the Southern Universities Nuclear Institute, it has for more than 20 years run a varied research programme in collaboration with university users. The Group is responsible for developing and coordinating the experimental requirements for the approved users of the Van de Graaff laboratory. Major research fields:

- Nuclear structure, nuclear reaction and fission physics with up to 6 MeV proton and deuteron beams, 12 MeV ^{3}He and ^{4}He beams and 23 MeV monoenergetic neutrons; atomic physics of inner shells of the atom studied with beam foil spectroscopy).
- Nuclear analytical chemistry using a range of techniques including on-line prompt emissions, off-line activation and analysis and radioisotope counting; application of nuclear techniques in other disciplines including industry, physical and biological sciences, medicine and agriculture and archaeology.
- Thin film solid state studies including laser modification of surfaces, laser induced doping and crystal regrowth, studies of metal silicides, and the use of nuclear techniques and electron microscopy for surface characterization.
- Cellular and molecular biology in relation to the onset of cancer.
- Development of computer based data processing systems.

Special facilities: The 6 MV Van de Graaff accelerator and associated ion sources for light and heavy ion acceleration with continuous or pulsed beam (down to 0,2 ns pulsing); on-line electronics and detection equipment with multiplexed and multiparamater data acquisition and analysis systems; on-line chamber systems for specialized studies of optical, X-ray and particle emissions induced by accelerated charged particle beams on solid and gas targets; off-line clean laboratory for sample preparation; computerized multi-sample spectral-counting system; equipment for surface studies: high-intensity pulsed laser, UHV deposition system, surface sputtering, and annealing apparatus.

Library

Head: Vacant

NATIONAL BUILDING RESEARCH INSTITUTE (NBRI)

Scientia, Pretoria
P O Box 395, Pretoria, 0001

Telephone: National (012) 86-9211
International + 27 12 86-8211
Telegrams: NAVORSBOU
Telex: 3-21312

Chief Director:	Dr J Morris	X 3831, 3832
Director:	Mr J A P Laurie	X 3835
Director:	Mr R J Page-Shipp	X 3833
Institute Secretary:	Mr S D du Toit	X 3841

Functions: The Institute was established in 1945 to conduct research to help meet the needs of South Africa in respect of building and construction and to promote the implementation of research findings. The Institute also acts as the principal technical evaluation agency to the Agrément Board of South Africa. Since investment in building and construction in South Africa now amounts to approximately R11 300 million per annum, the costs of planning, erection and maintenance of buildings and other structures are vital factors in the nation's economy.
Research and development activities relate to the design, planning and procurement of buildings, particularly housing, with special emphasis on lower income groups, health care facilities and educational buildings; structural and geotechnical engineering; fire in buildings; building services; behaviour and improvement of building materials, including the utilization of industrial wastes; evaluation of human indoor environmental requirements and means of satisfying them; building economics; energy use and conservation; and the technical aspects of building performance standards and regulations.

The Institute's income is derived largely from Parliamentary funds, but some 30 per cent is obtained from grants and earnings from contract work.
Five sponsored bursaries are awarded annually to members of staff for meritorious contributions to a particular field of research or applicability of research findings, enabling them to undertake study tours abroad. These are the Bester Building Research Merit Award; Riley Schachat Award for Building Research; Boumat Award for Building Research; Corobrik Merit Award for Building Research; and the J D Roberts Award for Building Research.
A Visiting Scientist award is sponsored by Messrs Everite S.A. which allows the Institute to invite prominent researchers.

Regular Publication: *NBRI Annual Review*, free.

Architectural Division

Head:	Mr K P J Napier	X 2561
Total staff:	23	
Research staff:	19	

The development of planning principles; innovative technology and design criteria relevant to the conception; design and construction of buildings for human settlements, specifically in fields such as housing, health care and education.

Building Services Division

Head:	Mr P R Crabtree	X 2478
Total staff:	14	
Research staff:	7	

Plumbing, sewer design and sewer flows; stormwater drainage; water supply in buildings; water reticulation systems; domestic water economy measures; appropriate technology for sanitation services.

Special facilities: Six-storey plumbing test facility; sewer flow gauging equipment; sewer air-testing equipment; mobile laboratory for field test work on pipelines, incuding CCTV inspection camera; computer-based data logging and processing equipment for laboratory and field monitoring of plumbing systems.

Energy in Buildings Division

Head:	Dr G Venter	X 3858
Totalal staff:	12	
Research staff:	5	

Energy consumption of buildings; investigation of the energy performance of buildings and its improvement by conservation measures and energy management procedures by means of computer modelling and simulation programs, energy auditing procedures and life cycle costing; research into accurate techniques to determine the heating and cooling loads and temperature conditions in buildings as well as the energy consumption of the different systems in buildings; procedures for the utilization of natural energy in buildings, particularly solar energy, both for active and passive applications.

Special facilities: CLEEHP full-scale experimental/demonstration project for the study and demonstration of the effects of energy conservation and active and passive solar energy techniques in dwellings in terms of conservation of energy, reduction in peak power demand and improvement in thermal comfort; monitoring equipment for the logging of operating data on site; test bed and equipment to determine the efficiency of low temperature solar collectors; computer programs to determine the thermal performance and energy consumption of buildings and systems in buildings; computer programs for active and passive solar systems.

Environmental Engineering Division

Head:	Mr J van Wamelen	X 3856
Total staff:	20	
Research staff:	9	

Research on the thermal performance of buildings; standards of comfort and their effect on productivity; the effect of building design on the indoor environment; climatic data for use in building design; study of problems relating to water penetration in buildings; sunlight control and lighting in buildings; physical properties of building materials; the effect of indoor climate on the potential productivity of factory and office workers and on the learning ability of school children.

Special facilities: Experimental huts to study the influence of roof and floor design on thermal performance; equipment to measure ventilation rates; instruments to record wind pressure on buildings; wind tunnel to measure the resistance of windows to air infiltration and water penetration; sky scanner to measure sky brightness distribution; solar shadowscope for the study of sunlight and shade problems; calorimeter to measure solar heat gains through different types of glass and shading devices; apparatus to measure the total transmittance of light through diffusing glazing materials; apparatus to determine rain resistance properties of masonry walls; climatic chamber for the study of thermal bridges in building elements; equipment to determine the water vapour permeability of building materials; cabinet to assess the performance of windows with respect to rain penetration; mobile climate chamber to study the effects of multiple environmental stress conditions on human health, well-being and productivity.

Fire and Concrete Engineering Division

Head:	Mr V R Boardman	X 2471
Total staff:	13	
Research staff:	4	

Research into aspects of fire, including fire protection, fire properties of materials and fire in relation to housing; concrete technology, including concrete creep, permeability, quality control, concrete cracking and the concrete-making properties of various waste materials.

Special facilities: 3 000 and 6 000 kN compression-testing machines for concrete cubes; a range of mechanical strain gauge equipment; equipment to study the properties of concrete, such as creep and water-tightness; humidity rooms (approximately 100 per cent and 50 per cent relative humidity); wall-testing furnace, horizontal furnace and other smaller furnaces; four-storey facility for full-scale fire tests; equipment for fire research.

Structural and Geotechnical Engineering Division

Head:	Dr A A B Williams	x 2470
Total staff:	21	
Research staff:	6	

Field and laboratory research into the performance and safety of structures, including structural model studies as an aid to design; evaluation of the structural adequacy of unconventional building systems and components; development of design criteria; investigation of basic parameters such as loads on structures, including studies of the effects of wind on structures; development of special instrumentation for monitoring wind loading on several full-scale structures; research into the nature and occurrence of expansive soils and their effects on buildings including methods of preventing damage to buildings from these causes, shearing phenomena in fissured and non-saturated soils, soil mapping, foundation design and soil/structure interaction; contract research related to instability of natural slopes and cuts, or problems associated with foundations for dams and dumps of solid industrial waste materials.

Special facilities: 1 000 kN universal testing machine; 2 900 kN compression testing machine for tests on columns, walls and beams; adjustable testing frame equipped with hydraulic jacks with capacities from 200 kN to 1 000 kN with static and low frequency cyclic loading control devices; boundary layer wind tunnel laboratory; electrical and mechanical strain guage equipment; vibration measuring equipment; multichannel electronic recording equipment for dynamic phenomena; computer-controlled 230 channel data logger; range of soil sampling and soils-laboratory testing apparatus.

Building Economics Division

Head:	Dr T W Miners	X 2544
Total staff:	6	
Research staff:	5	

Research into the organization and planning of construction work and the problems encountered in the building process, particularly economic, communications and statistical aspects, with a view to increasing efficieny in the industry; computer modelling of the industry for the assessment of the effects of planning and policy changes.

Organic Materials Division

Head:	Dr H M Saayman	X 3865
Total staff:	17	
Research staff:	8	

Research in the field of organic materials such as paints, plastics, rubbers and sealants; study of the properties of these materials in relation to the South African environment and the improvement of their performance by formulation, production and application; identification and analysis of unknown materials and components, and study of their degradation processes, whether thermal, photolytic or chemical; examination of the behaviour of flooring and waterproofing materials and systems in practice; study of the causes and nature of the corrosion of metals in the building industry in order to avoid or combat such deterioration.

Special facilities: Well-equipped laboratory for physical and chemical studies of organic building materials; facilities for analysis by infrared spectrophotometry, differential thermal analysis, thermogravimetric analysis, thermovolumetric analysis, centrifugation, high-performance liquid chromatography, thin-layer chromatography, pyrolysis gas chromatography, the preparation of paint formulations, compounding and moulding of rubbers and plastics, wear testing of floor coverings and accelerated aging of paints, rubbers, plastics; electrochemical, electron microscopic and metallurgical equipment for the study of metal corrosion in buildings - exposure stations in different climatic regions.

Inorganic Materials Division

Head:	Dr J E Krüger	X 2501
Total staff:	37	
Research staff:	9	

Research on the development, uses, quality and properties of inorganic materials used in the building industry, particularly cements, lime, aggregates, ceramic building materials, industrial waste products, inorganic fibres, precast products, natural building stone and waterproofing agents; the deterioration of building materials; chemical corrosion of cement products; dimensional change of building materials; causes of failures in building materials and means of preventing such failures.

Special facilities: Equipment for the study of building materials, particularly the application of chemical, mineralogical and physical techniques; atomic absorption spectrophotometer; equipment for differential thermal analysis and thermo-gravimetry; X-ray diffraction apparatus; optical microscopes; transmission electron microscope; scanning electron microscope; cutting, grinding and polishing equipment for the preparation of thin sections and polished sections of materials; apparatus for sorption studies; high temperature furnaces and equipment to measure and control high temperatures; temperature controlled rooms; equipment to determine the properties of clays for the manufacture of burnt clay products; apparatus to measure corrosion rates of cement products; equipment to determine consistency and workability of mortars; sensitive length-measuring equipment; apparatus for particle size and surface area determination; sensitive equipment for measuring the strength of materials.

Building Research Application Division

Head:	Mr R K Walker	X 3872
Total staff:	20	
Research staff:	1	

Provides a technical information service by bridging the gap between research and practice through the promotion of effective communications; disseminates research findings by means of publications, films, conferences and symposia and by answering personal, written and telephone enquiries; maintains active contact with the building and construction industry, the related professions, public bodies, property developers and financing organizations, as well as with other research organizations both in South Africa and abroad.

TECHNICAL SECRETARIAT OF THE AGRéMENT BOARD OF SOUTH AFRICA

General Manager: Mr C J Schlotfeldt X 3708

Housed in the same building and working in close collaboration with the Institute, the Board is an independent organization which undertakes secretarial work including interviews and contract negotiations with applicants for Agrément certificates; drafts of Agrément certificates; liaises closely with similar agrément organizations abroad and with the building industry, entrepreneurs, local authorities and members of the professions; prepares technical articles and authorities and members of the professions; prepares technical articles and reports for publication; distributes reports for publication and distributes publications and certificates among various local and overseas organizations.

REGIONAL OFFICES

Undertake the dissemination and application of research findings in practice; information and advisory services; the coordination of research investigations in their area; general assistance in solving problems caused by local conditions.

NBRI Regional Office for the Western Cape

6th Floor, 601 Saambou Building
cnr Burg and Castle Streets,
Cape Town, 8001

Telephone: (021) 24-9035
Telegrams: NAVORSBOU, Cape Town

Regional Officer: Mr F J Holmes

NBRI Regional Office for Natal

P O Box 17001, Congella, 4013

Telephone: (031) 25-5531
Telegrams: NAVORSBOU, Durban

Regional Officer: Mr D E Dobson

NBRI Regional Office for the Eastern Cape

P O Box 1124, Port Elizabeth, 6000

Telephone: (041) 53-2131
Telegrams: NAVORSBOU, Port Elizabeth

Regional Officer: Mr C J Lloyd

NBRI Regional Office for the Central Region

P O Box 12053, Brandhof, 9324

Telephone: (051) 7-0158
Telegrams: NAVORSBOU, Bloemfontein

Regional Officer: Mr D E Meyer

NATIONAL CHEMICAL RESEARCH LABORATORY (NCRL)

Scientia, Pretoria
P O Box 395, Pretoria, 0001

Telephone: National (012) 86-9211
International + 27 12 86-9211
Telegrams: NAVORSCHEM

Chief Director:	Dr J R Bull	X 2608
Institute Secretary:	Mr C P Steyn	X 2601
Liaison Officer:	Mr C M Meyer	X 2623
Total staff:	117	

Functions: To serve as a centre where the latest developments in chemical science are brought to bear on problems of national significance; to foster research in those areas of chemistry where there is a need for more fundamental knowledge; to collaborate with organizations concerned with the application and exploitation of research fundings; to undertake research projects in collaboration with other CSIR institutes, South African universities

and chemical industries; and to provide a range of national research services, including microanalysis, nuclear magnetic resonance spectroscopy, mass spectrometry, and single-crystal X-ray diffraction.

Analytical Chemistry Division

Head: Dr F W E Strelow X 2654

Carries out systematic determinations of ion exchange distribution coefficients and applies the results to the separation and determination of elements in the analysis of rocks, minerals and other inorganic materials; participates in projects for the preparation of inorganic standard materials on national and international levels and develops improved methods for the separation of radio elements; and carries out elemental analyses on organic and coordination compounds.

Special facilities: Two atomic absorption spectrometers; Philips semi-automatic X-ray fluorescence spectrometer (PW 1410); ultraviolet spectrophotometer; recording potentiometer which can be coupled to a filter-photometer to record photometric titrations; METROHM Polarecord E506 instrument for polargraphic and voltametric work; automatic fractionators; temperature controlled shaking bath; automatic CHN analysers; Knaver vapour pressure osmometer for determination of molecular weight.

Corrosion Research Division

Head: Vacant X 3996

Investigates the causes and prevention of the corrosion of metals due to both the cathodic liberation of hydrogen and the reduction of oxygen, especially in neutral and alkaline solutions at elevated temperatures; studies methods of determining and monitoring instantaneous corrosion rates; studies the relative corrosion rates of the metals comprising different alloys as well as stress corrosion cracking of ferrous alloys, metals comprising different alloys as well as stress corrosion cracking of ferrous alloys; studies the role of various parameters as related to either activation or diffusion controlled corrosion processes; undertakes consultation services and short-term contract investigations of corrosion problems in the industry.

Special facilities: Instruments for the field measurement of soil resistivity and the corrosion potential of buried metal and immersed structures; computerized electrochemical methods for the rapid determination of corrosion rates of metals in soils and waters as well as various chemicals.

Inorganic Chemistry Division

Head: Dr E Singleton X 2646

Activities are directed largely towards the fundamental understanding and development of transition metal based catalysts, particularly those with relevance to chemical industries in the Republic. The programme involves investigations of new synthetic routes to complexes of potential catalytic activity, structural studies aimed at elucidating factors that influence chemical reactivity, and mechanistic investigations into the catalytic behaviour of these complexes.

Special facilities: Ultraviolet, visible and infrared spectrophotometers; Fourier transform infrared spectrometer coupled to a gas chromatograph; gas chromatograph; 'stopped flow' spectrophotometers coupled to a microcomputer; facilities for studying catalytic reactions under ambient conditions; high-pressure autoclave and gas manifold; facilities for working in an inert atmosphere.

Molecular Biochemistry Division

Head: Dr D P Botes X 2613, 2617

Conducts research into the purification and physical, chemical, immunological and structural properties of biological molecules of peptides and proteins; studies algal and snake venom toxins, plant toxalbumins, proteinase inhibitors, lectins, various enzymes and phosvitins as well as the interaction of these molecules with biological membranes.

Special facilities: Facilities for the fractionation and characterization of proteins and peptides, including refrigerated centrifuges; Spinco model E analytical centrifuge; model L zonal ultracentrifuge; light-scattering photometer; fluorescence spectrophotometer; high-pressure liquid chromatograph; osmometers; Coulter counter; Tiselius-Hilger electrophoresis apparatus; amino acid analysers; automatic analyser for sequence determination; liquid scintillation counter spectrometer; sample oxidizer; cell culture and hybridoma facilities; 2254 Hewlett-Packard data acquisition and data reduction system.

Organic Chemistry Division

Head: Dr P S Steyn X 3264

Investigates the synthesis of modified steroidal hormones and novel heterocyclic compounds; isolates toxic fungal metabolites and plant products and studies their structure and biosynthesis; studies fundamental nuclear magnetic resonance (n.m.r.) phenomena; applies multinuclear n.m.r. spectroscopy to structural and stereochemical problems in organic and organometallic chemistry; carries out X-ray diffraction and molecular mechanics studies on complex organic molecules; studies the application of mass spectrometry and chiroptical methods in organic chemistry; provides specialized n.m.r., mass spectrometry and X-ray diffraction services.

Special facilities: Preparative and analytical high-performance liquid chromatographs; gas-liquid chromatograph; ultraviolet and infrared spectrophotometers; automatic polarimeter; spectropolarimeter for optical rotatory dispersion and circular dichroism (Jasco J-20); high-resolution mass spectrometer (Varian Mat 212); 500 MHz multinuclear n.m.r. spectrometer (Bruker WM-500) with satellite data-processing facility; n.m.r. spectrometers for routine ^{1}H, ^{13}C, and ^{31}P work (Varian XL-100-15, CFT-20, and EM-390; Enraf Nonius CAD-4 X-ray diffractometer with a facility for data collection at low temperature.

NATIONAL ELECTRICAL ENGINEERING RESEARCH INSTITUTE (NEERI)

Scientia, Pretoria
P O Box 395, Pretoria, 0001

Telephone: National (012) 86-9211
International: + 27 12 86-9211
Telegrams: NAVORSELEK

Chief Director:	Mr J D N van Wyk	X 3057
Programme Leader: Cybernetics	Mr J H J Filter	X 3052
Programme Leader: Microelectronics	Dr T C Verster	X 3185
Programme Leader: Power Systems	Dr A J Eriksson	X 4482
Institute Secretary:	Mr B J De Klerk	X 3058
Total staff:	234 posts	

Functions: The Institute undertakes research and development and provides services in the fields of cybernetics (comprising digital systems technology and industrial technology), microelectronics and power systems; operates a facility for the manufacture of special integrated circuits and a training facility for electronics technicians.

PROGRAMMES

MICROELECTRONICS TECHNOLOGY

Programme Manager: Mr J D Stulting X 2392

Promotes the electronics industry in South Africa by supporting microelectronics development through a judiciously selected research and development programme; provides a basic infrastructure, specialized services and technical know-how to support the growth of a local integrated circuit (IC) community. For this purpose the Group undertakes research into fundamental semiconductor technology, including process and component development for custom applications; provides an advisory service to digital IC designers and investigates new logic techniques and structures which are possible in bipolar technology; undertakes the design of analogue IC's, centered on the development of functional circuit modules for use in IC design; provides an uncommitted IC design service to designers from outside concerns; gives attention to the design of new IC's; continuously expands the computer-aided IC design facilities.

Special facilities: Computer-aided design facilities; numerically-controlled photo-optical maskmaking equipment; ion beam etcher; associated laboratory equipment.

POWER SYSTEMS TECHNOLOGY

Programme Manager: Mr H Kröninger X 4035

Undertakes research in the broad areas of lightning and transients, high-voltage, insulation, and EMC measurement and testing, and more specifically undertakes lightning research, centered on the study and measurement of

lightning parameters and incidence, including computer modelling techniques; studies and measures lightning disturbances in distribution systems in order to establish the engineering implications of lightning; undertakes high-voltage research, including the study of impulse and AC atmospheric and geometric correction factors in basic electrode configurations; in the field of insulating materials and testing techniques, studies the mechanism of insulation failure, including the effect of pollution on organic insulating materials; studies industry-related electromagnetic interference problems, and establishes methods to ensure electromagnetic compatibility.

Special facilities: Well-equipped outdoor high-voltage laboratory (including a 3,2 MV impulse generator and 1 000 kV AC facilities); lightning disturbance recording stations on an 11 kV, 10 km test transmission line; 60 m lightning mast instrumented to measure lightning discharge current parameters; well-equipped laboratories for investigations into electromagnetic interference.

DIGITAL SYSTEMS TECHNOLOGY

Programme Manager: Mr D Perold X 3047

Activities can be divided into three categories, *viz.* research into signal processing and communication using digital techniques, comprising research into speech coding for storage and transmission, and research into pattern recognition; investigations into secure communications and error control codes, and also into new applications of digital communications, including spread spectrum techniques; computer technology, aimed at the development of multi-processor systems for special purposes.

Special facilities: Signal processing computer for spectrum and transfer function analysis; electronic camera for motion studies.

INDUSTRIAL TECHNOLOGY

Programme Manager: Mr R A Swan X 3617

Undertakes research on modern developments in industrial automation, comprising investigations into the application of computer-integrated manufacturing (CIM) and robotics techniques, including the design and development of a semi-automatic robotics station for the assembly and testing of printed circuit boards (pcb's); develops and constructs prototype instruments; applies CIM technology, e.g. in computer-based management programmes and automated test techniques, and investigates the use of infrared as a diagnostic tool for the testing of pcb's; develops specialized systems for automatic water quality measurements; undertakes power control - *ad hoc* evaluations of battery-powered electric vehicles in cooperation with industry; in the field of power electronic application studies the developments in power electronics, including unconventional energy sources.

Special facilities: Demonstration cell to support a broad-based robotics research programme; a dynamometer for electric vehicle assessments.

SERVICES AND FACILITIES

TRAINING FACILITY

Manager: Mr Z F Joubert X 3372

Provides training for the CSIR's pupil technicians registered for the sandwich course which leads to the National Diploma and National Higher Diploma in Electronic Engineering. A limited number of students from outside organizations may also be accommodated.

Special facilities: Demonstration sets and trainers for training in electronics; Cromenco Z-2H computer system.

INTEGRATED CIRCUIT FACILITY

Manager: Mr J D Stulting X 2392

Manufactures special or custom-designed IC's; promotes the use of special IC's in the South African electronics industry.

SUPPORT SERVICES

Coordinator: Mr H J H Wehrhahn X 4029

Maintenance Services: Maintains electronic equipment for the CSIR and outside organizations.

Calibration Services: Undertakes certificated calibration of electronic instruments in accordance with the standards of the National Calibration Service.

Special facilities: Well-equipped laboratories for the calibration of electronic instruments.

Branch

Western Cape
Manager: Mr H Thomas Tel. (024) 4-3620 x 222
c/o NAC, P O Box 72, Faure, 7131

Workshop Services: Precision mechanical services are provided for maintenance and research.

Drawing office: Provides tracing and technical drawing services.

ADMINISTRATION SERVICES DEPARTMENT

Information Services Division

Acting Head: Mr B J de Klerk X 3058

Provides publishing and laison services as well as library and technical information services; undertakes the editing, processing and distribution of all Institute publications and reports; issues two regular technical newsletters, *NEERI News* and *Round the Circuit*, and other publicity material; provides a technical liaison service to maintain contact with other CSIR institutes, research organizations and government departments, including participation in the activities of certain national and international committees; arranges regular technical works discussions, lectures and colloquia; runs a technical information service based on a comprehensive series of catalogues and data books on electronic equipment and components; deals with technical enquiries.

Special facilities: Technical library to keep staff informed of the latest developments in their field of research and to index Institute publications and reports and private technical document collections of staff members to make this information accessible to interested parties.

NATIONAL FOOD RESEARCH INSTITUTE (NFRI)

Scientia, Pretoria
P O Box 395, Pretoria, 0001

Telephone: National (012) 86-9211
International + 27 12 86-9211
Telegrams: NAVORSVOED

Chief Director:	Dr L Novellie	X 2203
Director:	Dr P J van Wyk	X 2187, 2205
Deputy Director:	Mr P de Schaepdrÿver	X 2498, 2193
Institute Secretary:	Mr B D Whittaker	X 2205
Total staff:	146	

Functions: To promote the effective utilization of South Africa's food resources by undertaking fundamental and applied research into aspects of food composition, utilization, preservation and storage, fermentation technology; as well as product and process development.

Research is largely financed with a Parliamentary grant, but additional income is obtained from research contracts with industrial and other organizations.

The CSIR Microbiology Research Group and the Sorghum Beer Unit are accommodated and administered by the Institute.

Food Technology Division

Head: Dr P J van Wyk X 2187, 2205

Studies the processing of foods for the improved utilization of food resources by the reduction of food and nutrient losses; develops new food products; evaluates the processing characteristics of new plant cultivars; studies storage of foods; undertakes the investigation of special problems for individual manufacturers; investigations are statistically designed and analyzed.

Special facilities: Food processing equipment, including a test mill; air classification apparatus; extruder-cooker; a variety of driers (spray, roller, tunnel); fruit press; fruit juice process line including aroma recovery unit,

centrifuges and evaporators; climatic chambers for storage studies; agitating retort for canning studies.

Biological Evaluation Division

Head: Dr J J Dreyer X 2180

Investigates problems related to the utilization and biological value of foodstuffs by using animals, including primates, balance and other techniques; studies the breeding and growth performance of experimental animals, as well as the biochemical and histological effects of specific diets.

Special facilities: Eight air-conditioned rooms - four for small animal work and four for primates; 310 metabolism cages of special design for rats; a low-temperature laboratory for biochemical work; oxygen uptake spirometer for rats; Siebtechnic Vibratory Disc mill; all facilities for histological investigation including a Philips 301 electron microscope; Kjel-Foss apparatus for automatic nitrogen determination; ultracentrifuge; liquid scintillation counter; Beckman spectrophotometer; Perkin-Elmer 560 atomic absorption spectrophotometer; a Büchi 445 digestor; a variety of special-purpose dry food mixers.

Food Chemistry Division

Head: Mr P J van Niekerk X 3172

Develops, improves and evaluates analytical methods for the analysis of food and related biological materials in order to render a service to other divisions in the Institute, industry and other organizations; supplies the results of an analysis and is also involved in the planning and execution of the research project.

Special facilities: Atomic absorption spectrophotometers; spectrophotometers; high-performance liquid chromatographs, colorimeters; fluorimeter; spectro-fluorimeters; extraction apparatus; particle size analyzer.

Fermentation Technology Division

Head: Dr T G Watson X 2897, 4223

Builds up a body of knowledge and expertise on fermentation technology through fundamental microbiological and biochemical studies of microbial behaviour in order to develop fermentation processes applicable to industry.

Special facilities: Laboratory fermentors for batch and continuous fermentation studies and a computer-coupled 150 litre plant fermentor; ancillary equipment including a pilot-scale continuous centrifuge and a high-volume cassette ultrafiltration unit.

Oils and Fats Division

Head: Dr L M du Plessis X 3148

Analyzes and characterizes lipids with emphasis on edible plant oils and oilseed products in order to make better use of these raw materials which are used for

a wide range of foodstuffs; maintains close contact with the oil expressing industry and related manufacturers to ensure that their needs are incorporated in the research programme; undertakes contract services and investigations where possible.

Special facilities: Capillary and packed-column gas chromatographs; Iatroscan rod thin-layer instrument for the quantification of lipid classes; ultraviolet and infrared spectrophotometers for the physical characterization of lipids; Rancimat instruments for stability studies.

Microbiology Research Group

Head: Dr J P van der Walt X 2195

Fundamental as well as technologically innovative research diversifies along two lines:

Research on yeasts - introduction of genetic methods for the possible improvement of technologically relevant strains; taxonomic studies centering on the rationalization of the anamorphic taxa as naturally delimited entities on the basis of affinitive (mainly ultrastructural) characters; and systematic-ecological studies of taxa associated with Southern African habitats.

Research on species of the genus *Rhodococcus* (capable of degrading animal and plant sterols to possible precursors for the chemical synthesis of pharmaceutical steroids) - isolation and selection of sterol-degrading strains; production of mutants which degrade the aliphatic side chain selectively without undesirable modification of the conjugated ring systems; classification and systematics of industrially important strains; the development of genetic systems for such strains; and the ultimate application of techniques for the possible cloning and manipulation of the genes which code for the degradative pathway.

Special facilities: Equipment for the large-scale submerged culture of micro-organisms; facilities for micromanipulation; and equipment for determining ploidy by X-ray inactivation.

SORGHUM BEER UNIT

Head: Dr L Novellie X 2203

A group of specialists comprising chemists, biochemists, chemical engineers and microbiologists devoted to the research requirements and industrial problems of the sorghum beer industry.

Brewing Technology Division

Head: Mr P de Schaepdrijver X 2498, 2193

Research and development for the sorghum beer industry and that part of such work that deals directly with brewing. There are four main sections - Brewing Science, Brewing Technology Research, Industrial Projects and Technology Transfer.

Development Work - includes technology for improved production and new products; brewing control methods; novel beer containers. Laboratory-scale processes are scaled up via the pilot plants for application in industry.

Advisory and Special Services - Advises on the siting, capacity and design of new breweries, packaging, beerhalls, etc; holds courses in brewing technology at the Pretoria Technikon; renders a current awareness service in the form of an information service bulletin to industry.

Special facilities: Experimental brewing plant; continuous fermenters; experimental malting plant; Brabender viscograph; Brabender hardness tester; automated nitrogen amino acid and sugar analysis equipment; automatic titration and pH-stat apparatus; Haake viscometer.

Cereal Biochemistry Division

Head: Dr C W Glennie X 2161

As a result of the industrialization of sorghum beer production research is undertaken on all basic and technological aspects of raw materials of cereal origin including the changes in sorghum grain by the malting process and the breakdown of the cereal reserves of starch, protein, maize, sorghum and sorghum malt during mashing to produce a medium for fermentation.

NATIONAL INSTITUTE FOR AERONAUTICS AND SYSTEMS TECHNOLOGY (NIAST)

Scientia, Pretoria
P O Box 395, Pretoria, 0001

Telephone: National (012) 86-9211
International + 27 12 86-9211
Telegrams: NAVORSSTELSEL
Telex: 3-21129

Chief Director: Dr T J Hugo X 2725, 2726
Director:
(Electronic Engineering): Dr L L van Zyl X 4258
Director:
(Mechanical Engineering): Mr A J van Wyk X 2351
Institute Secretary: Mr R Engelbrecht X 2743

Functions: To develop technological expertise in the fields of electronics, systems and aeronautics and to provide technical support for the benefit of the relevant industries.

The Institute's main activities are concentrated on flight dynamics, aerodynamics, aircraft structures, propulsion, servo-mechanisms, and digital and microwave systems. Multidisciplinary projects, some involving extensive systems analyses, are also undertaken.

Electronics Laboratory

Head: Dr D E Baker X 2813

Development work in the field of electronic engineering, specializing in electromagnetic, electro-optical and digital systems.

Systems Laboratory

Head: Mr E C J Taljaard X 3572

Advanced development of multidisciplinary systems to satisfy defined requirements of sponsors.

Aeronautics Laboratory

Head: Dr A J Vermeulen X 3183

Technological development in the fields of high and low speed aerodynamics; flight dynamics propulsion and aircraft structures.

Facilities: 2 x 1,5 m subsonic windtunnel, 0,5 m trisonic tunnel (Mach 0,6 to 4,3); structural test equipment.

Technical Support Laboratory

Head: Mr R G Collins X 4058

Supports the research and development programmes in the Institute.

NATIONAL INSTITUTE FOR COAL RESEARCH (NICR)

21 Lynnwood Road, Pretoria
P O Box 217, Pretoria, 0001

Telephone: National (012) 342-1020
International + 27 12 342-1020
Telegrams: FURESBO
Telex: 3-20430

Chief Director:	Dr T C Erasmus	X 212
Director:	Dr J Dekker	X 213
Deputy Director:	Dr D Clark	X 222
Deputy Director:	Mr M C J van Vuuren	X 267
Institute Secretary:	Mr J W van Straaten	X 211
Total staff:	268	

Functions: The Institute, formerly the Fuel Research Institute of South Africa (founded 1930), was incorporated into the CSIR on 1 April 1983. The Institute has three division at Lynnwood Road, extensive pilot plant facilities at Research Road, Pretoria West, and a station for the sampling of coal in Durban. The three divisions conduct basic and applied research, both in the national interest and under contract to the coal industry and government departments.

Chemistry Division

Acting Head: Mr P J Tasker X 269

Studies on coal structures; direct liquefaction of coal, including aspects such as hydropyrolysis and catalytic hydrogenation; refining of liquid products to specification fuels; utilization of pitch as an electrode binder and feedstock for needle coke; coal preparation by means of oil agglomeration and dry beneficiation; mineralogical studies of coal in close collaboration with the Survey

Division; organic and physical analytical services rendered on a routine basis; and coal mining safety studies comprising the explosibility of coal dust, the occurrence of methane, underground spontaneous combustion, investigation of the causes of explosions in collieries and advice to the Government Mining Engineer in respect of safety regulations in mining.

Engineering Division

Head: Dr D Clark X 222

Undertakes pilot and laboratory scale research and development in coal combustion, gasification, carbonization and preparation; particular research projects include the fluidized-bed combustion of coal, combustion of coal on chain grate stokers, the fluidized-bed gasification of coal, producer gas from coal, the beneficiation of fine coal and fundamental studies in coal combustion; undertakes acceptance tests on most of South Africa's coal preparation plants, as well as test work on commercial boilers and producer gas plant; liaises closely with both utilizers and producers of coal in order to assist with technical problems and to obtain an adequate background in the fields covered by its research projects.

Special facilities: Multiprocess coal preparation pilot plant; chain grate stoker fired test boiler; a fluidized-bed combustion boiler; a briquetting plant; rotary carbonizer.

Survey Division

Head: Mr M C J van Vuuren X 267

Various laboratories provide analytical services, in support of internal research projects and also to the industry regarding exploration programmes and other requirements. The Division conducts routine surveys of colliery products and exercises statutory control over export coal; undertakes fundamental and applied petrographic research to characterize coal from various geographical areas; studies the mineralogical composition of coal with respect to utilization of coal; the mineralogical composition of coal with respect to utilization of coal; studies the macro-, micro- and trace element distribution in South African coals and coal ash.

Special facilities: Coal sample preparation section; automated calorimeters; automated sulphur determiners; equipment for proximate, ultimate and other determinations; atomic adsorption spectrophotometers; colour spectrophotometer; reflectance microscopes; petrographic and mineralogical microscopes; X-ray diffractometer.

Library

Head: Miss L B Bodenstein X 260

A fully equipped library is available to those interested in coal research.

NATIONAL INSTITUTE FOR INFORMATICS (NII)

Scientia, Pretoria
P O Box 395, Pretoria, 0001

Telephone: National (012) 86-9211
International + 27 12 86-9211
Telegrams: NAVORSINFO
Telex: 3-21287

Chief Director:	Mr V A Shaw	X 2852
Director, Library Services:	Miss N M Lodder	X 3358
Director, Information Services:	Mr A G Brunt	X 2075
Deputy Director, Computing Facilities:	Mr A P K Dabrowski	X 3311
Deputy Director, User Support Services:	Mr G Ladner	X 3144, 3537
Total staff:	240	

The Institute was established in 1984 and combines the functions of the former Centre for Scientific and Technical Information (CSTI) and the Centre for Computing Services (CCS).

LIBRARY SERVICES

Director: Miss N M Lodder X 3358

Provides a national library service in the field of science and technology in order to make available documents which meet the varying information needs of the scientific, technical and industrial community in South Africa.

Document collections are maintained which comprise some 150 000 monographs and 6 000 serial titles as well as a number of report series of foreign government and research organizations covering most subject areas in the broad field of science and technology; the agricultural and medical sciences are not covered.

Library User Services:

Contact persons:	Mrs J M Pistorius	X 2005
	Miss A M Nolte	X 2040

Supplies users with required documents; assists users in identifying and obtaining relevant documents in the CSIR's collection; makes photocopies of documents and obtains required publications which are not in the CSIR's collections from other South African libraries through the national interlending system or from organizations abroad (usually in the form of photocopies); uses internationally available online ordering and other rapid document delivery services for urgent requests.

Periodicals in Southern African Libraries (PISAL)

Contact person (Head): Mrs T Robarts X 2013, 2001

Compiles *Periodicals in Southern African Libraries* (PISAL), the union catalogue of serials held by libraries in Southern Africa.

INFORMATION SERVICES

Director: Mr A G Brunt X 2075

S A Water Information Centre (SAWIC)

Contact persons (Head): Mr M R Steyn X 3083
Dr H L M Christie X 2048

The Centre, which is financed by the Water Research Commission, disseminates informaton on water research publications and related activities in South Africa by compiling, expanding and maintaining a comprehensive computerized bibliographic database, WATERLIT; offers services free of charge to the South African public including retrospective and SDI searches and a current awareness services, *Selected Journals on Water*, a monthly publication (consisting of the index pages of some 45 of the more important journals on water); publishes *The Water Industry in South Africa* and *Register of South African Hydrological Data Sources*.

South African Energy Information System

Contact persons: Mrs C E Louw X 2094
Miss C S de Vos X 2094

Established in 1984 as a collaborative effort with the Department of Mineral and Energy Affairs and the CSIR's Foundation for Research Development.

Coordinates energy information activities in South Africa and makes available information on all aspects of energy.

Information Services Group

Head: Mr D P Steyn X 2041

Offers both conventional and computerized information services to the scientific and engineering community in general and to industry in particular. A technical enquiry service and industrial field liaison are provided to alert industry to the extensive support that CSIR institutes can provide in the technical and engineering fields. Regional Offices in Johannesburg, Cape Town, Port Elizabeth and Durban offer similar services also ensuring that remotely located industries in decentrialized areas have access to CSIR facilities.

Enquiry Service
Contact persons (Head): Mrs M E de Vries X 2152
Mrs I G de Bont X 2152

Assists in the solution of scientific and technical problems by providing information either directly from reference books and other publications, literature searches on the available local CSIR bibliographic databases, or by establishing contact with experts in the appropriate field; maintains the Appropriate Technology Information Centre.

The South African Retrospective Information System (SARIS)/The South African Selective Dissemination of Information (SASDI)

Contact persons (Head):	Mrs R McGillivray	X 3619
	Miss L M Schnugh	X 3359

SARIS prepares literature surveys for CSIR staff and industry by means of computerized searches of large information systems in America, Britain and Europe covering all fields of science and technology except medicine; provides a Patent Service, and a CAS (Chemical Abstracts Service) ONLINE service; affiliated centre of the Cambridge Crystallographic Data Centre.

SASDI helps scientists to keep-up-to date with the current literature in their field by subscribing to subject interest profiles on *Biological Abstracts, Chemical Abstracts, Engineering Index, National Technical Information Service, Metals Abstracts* and *Science Abstracts*; profiles on other databases are possible.

Technical Information Service

Contact persons (Head):	Mr C B de W Barnard	X 2083
	Mr T G Nell	X 2046

Promotes and maintains liaison between industry and the CSIR; publishes the weekly *Manufacturing Technology Reviews* (MTR), a current awareness service based on articles selected from a wide range of international journals which alerts individual firms to the more important articles relating to industry; publishes *Technical Information for Industry* (TI), irregularly, in which new developments in research at the CSIR and services available from different institutes at the CSIR are examined.

Construction Industry Computer Information Centre (CICIC)

Manager:	Mr J D Lawson	X 3138

Provides a framework for coordinating the acquisition and dissemination of information in the field of computers in the engineering, architectural and constructional fields; liaises with similar organizations overseas; publishes a *Construction Industry Software Index* and *CICIC Newsletter* at regular intervals.

COMPUTING FACILITIES

Deputy Director:	Mr A P K Dabrowski	X 3311

Offers centralized and distributed computing facilities available to all CSIR institutes via a countrywide network.

Computing Facilities:

Contact persons:	Control Data Cybers:	Mr P Barlow	X 3299, 3536
	Amdahl/IBM:	Mr A P K Dabrowski	X 3311, 3088
	Network:	Mr N van Rensburg	X 3270

Special facilities: Control Data CYBER 170/174, CYBER 170/750; CYBER 170/815 each with 262K 60-bit words main storage; 8380 Megacharacters online disk storage; countrywide network of interactive and remote job entry terminals, run under NOS 2.2 Network Operating System and used mainly for scientific/ engineering processing; Amdahl 470V/7 with 12 Megabytes main storage and 8750 Megabytes online disk storage; countrywide network of interactive and remote job entry terminals, runs under IBM MVS/SP 1.1 operating system and used mainly for information processing.

USER SUPPORT SERVICES

Deputy Director:	Mr G Ladner	X 3144, 3537
Contact persons:	Mrs A Erasmus	X 2857
	Mr W Schoeman	X 2052, 3537

Investigates and develops new tools for the Institute and its users and provide assistance in using them effectively; educational courses are also run in collaboration with the various sections of the Institute.

- Courses for Users of the Computing Services:

Contact person: X 3500, 3488

Introduction to CDC Job Control Language; Advanced CDC Job Control Language; FORTRAN (CIM) DEKLTAK course; The use of SPSS (Statistical Package for the Social Sciences); Introduction to SPF (System Productivity Facility) on the Amdahl; Introduction to IBM Job Control Language; Introduction to SAS (Statistical Analysis System); ATMS (Advanced Text Management System); and OMNICALC (Spreadsheet program on Amdahl)

- Courses in the field of information and library science:

Contact persons:	Ms P J Castle	X 2050
	Mrs A Erasmus	X 2857

Search Strategy Design; Computers and the Library; Patents and Patent Information; ORBIT Online Training; An introduction to Library and Information Services in the CSIR; Setting up a Small Library; Database Design and Development; Indexing; DIALOG Online Training; and SAMARC Training.

REGIONAL OFFICES

Eastern Cape Regional Office:

Mr V R Bunyard
c/o S A Wool and Textile
Research Institute
Gomery Avenue, P O Box 1124,
Drift Sands, Port Elizabeth, 6000

Telephone: (041) 53-2131
Telegrams: SAWTRI, Port Elizabeth
Telex: 74-7603

Natal Regional Office:

Mr T W Trytsman
King George V Avenue
P O Box 17001, Congella
Durban, 4013

Telephone: (031) 25-5531
Telegrams: NAVORS, Durban
Telex: 62-2431

Western Cape Regional Office:

Mr P F Evans-Watt
East Street
P O Box 109, Sanlamhof,
Bellville, 7532

Telephone: (021) 97-6181
Telegrams: NAVORS, Cape Town

Witwatersrand Regional Office:

Mr A M MacDonald
Frost Avenue, P O Box 32410,
Cottesloe, Braamfontein, 2017

Telephone: (011) 726-7100

Computing Services, Western Cape:

Mr G I Edwards
P O Box 72, Faure, 7131

Telephone: (024) 4-3620
Telex: 57-22202

Computing Services, Western Cape:

Mr G I Edwards
P O Box 72, Faure, 7131

Telephone: (024) 4-3620
Telex: 57-22202

NATIONAL INSTITUTE FOR MATERIALS RESEARCH (NIMR)

Scientia, Pretoria
P O Box 395, Pretoria, 0001

Telephone: National (012) 86-9211
International + 27 12 86-9211
Telegrams: NAVORSMATERIALS, Pretoria

Chief Director:	Prof. G G Garrett	X 2862, 2792
Institute Secretary:	Mr P S Mörsner	X 4388
Liaison Officer:	Mrs A M Swart	X 4387
Total staff:	140	

Functions: The Institute carries out advanced research into the relationship between the structure and properties of materials, the processing of materials in line with structure-property relationships and the performance of materials in engineering systems. Technologies are developed to replace imported materials and to find new applications for local raw materials. Research is aimed at the needs of industry.

CERAMICS, GLASS AND PHASE STUDIES DIVISION

Head: Dr S Hart X 2783

Development of new and important ceramics, glasses and single crystals and characterization of the structure and properties of these materials. Research areas currently receiving attention are processing of piezoelectric ceramics and structural ceramics such as zirconia and silicon nitride; specialized glass development; crystal growth of optical materials; high-pressure synthesis of materials; thermal and mechanical properties of materials; X-ray diffraction studies at various temperatures and pressures.

Special facilities: Ceramic powder processing and characterization equipment; uniaxial and isostatic presses; sintering furnaces; glass processing facilities; high-temperature crystal growth apparatus; high-pressure equipment; single crystal and powder X-ray facilities including high and low temperature attachments and high-pressure cells; differential thermal analysis and dilatometry equipment.

NIMR TASK GROUP

Head: Dr J T Fourie X 3420

The Division consists of six sections. Strong emphasis is placed on fundamental research. Advanced materials characterization is undertaken in order to develop new or existing but unobtainable strategic materials.

Atomic spectroscopy - Research on emission, glow discharge, inductively coupled plasma and atomic absorption; the application of these methods to quantitative analysis of elements in ferrous alloys and other inorganic and organic compounds.

Special facilities: 2 m RSV Ebert grating spectrometer with photographic and photoelectric facilities; 1 m Paschen Runge vacuum direct reading spectrometer; 1 photographic spectrograph; two atomic absorption spectrometers, inductively coupled plasma source with an RF generator up to 5 kW; ARL 33 000 sequential quantometer with 26 channels; universal vacuum spectrometer with computer control over analytical programs; computer-controlled scanning monochromator; LECO gas analysis equipment for quantitative determination of C, S, N, O and H in bulk specimens.

Mass spectrometry - Research on analytical methods of determining trace elements in ferrous alloys and other inorganic and organic materials at concentrations as low as parts per million.

Special facilities: Vacuum Generators ZAB high-resolution scanning mass spectrometer with a glow discharge plasma source and full computer control; Varian D C arc source mass spectrograph; Nier-Johnson mass spectrometer with a glow discharge plasma source; computer- controlled microphotometer.

X-ray fluorescence spectrometry - Research on analytical methods of rapid bulk analysis of ferrous alloys and other inorganic and organic materials; depth profiling of elemental concentrations by inclined X-ray incidence methods.

Special facilities: Computer-controlled vacuum X-ray spectrometer; direct electron excitation X-ray spectrometer.

Surface science: Study of surface composition and binding energies of adsorbed compounds, electron energy loss spectroscopy, Auger electron energy spectroscopy and X-ray and UV photon electron spectroscopy methods; investigation and application of methods using ion beams to obtain qualitative and quantitative information on the distribution of elements in the uppermost atomic layers of surfaces in organic materials and in devices.

Special facilities: Phi Electronics Scanning Auger Microprobe 595 with microprocessor control; Varian 240 LEED system with Auger spectroscopy attachment; electron spectroscope for chemical analysis (ESCA); ARL scanning ion microprobe mass analyser.

Electron microscopy - Research on plastic deformation of metals by means of electron microscopy; electron interaction phenomena; secondary electron detection systems; convergent beam diffraction.

Special facilities: 200 kV electron microscope (JEOL JSM-200) capable of operating in transmission, scanning transmission and surface scanning modes; computer-controlled JEOL CXA-733 electron microprobe with three wavelength dispersive X-ray spectrometers, X-ray energy dispersive spectrometer with a LeMont image analyser; JEOL JSM-U3 scanning electron microscope with and EDAX/EDIT system for quantitative determination of elements; Philips 100 kV transmission electron microscope; light microscope, 2 vacuum deposition units and 1 sputtering deposition unit, furnaces for production of single crystals; facilities for strain-free sectioning of crystals.

Electronics development and automation - Development of experimental measurement and control systems; routine electronic maintenance; support for microcomputer systems.

Special facilities: 8 microcomputers, the majority of which are interfaced with existing instrumentation; standard test and measuring instruments.

METALS DIVISION

Head: Dr N R Comins X 3420, 3423

Research and development on new alloys for specific purposes; study of the relationship between the microstructure of metals and alloys and their macroscopic properties, viz, mechanical, physical and chemical. Research ranges from basic through to directed contract work and also includes aspects of processing, fabrication, etc. Current topics include alloy development with regard to import replacement, cheap stainless steels, high chromium stainless steels, dual-phase alloys, heat resistant alloys, wear resistant alloys; sliding and abrasive wear; surface treatments and coatings; mechanical behaviour of metals and alloys; short-term metallurgical research for industry and failure analysis.

Special facilities: 75kW induction melting plant of 12 and 50 kg capacity; foundry equipment for sand moulding; 65kW vacuum induction melting (VIM) plant of 12 and 45 kg capacity with computer data acquisition system; laboratory rolling mill; heat treatment furnaces including vacuum and controlled atmosphere type; cut-off machines; surface grinders; laboratory spark machine; hardness and microhardness testers; complete macro- and micro-metallographic facilities including an Omnicon Alpha 500 image analyser; block-on-ring sliding wear machine; Falex dry sand/rubber wheel abrasion tester; thermochemical surface treatment facilities; chemical vapour deposition unit; ion-beam thinner; Instron Model 1340 closed-loop servo-hydraulic testing system with two load frames (500kN and 200 kN static capacity); high-temperature (up to 1000 °C tensile and fatigue system for Instron; ATS creep/stress rupture machine.

ELECTRONIC MATERIALS DIVISION

Head: Dr H Booyens X 3635

Study of the structure and opto-electronic properties of electronic materials with special emphasis on semiconductors. Current projects involve: the preparation of semiconductor materials in polycrystalline and single crystal form by means of specialized growth techniques; the structural electronic and optical characterizaton of these materials; the development of ohmic and rectifying contacts on semiconductor materials.

Special facilities: Crystal growth apparatus; polishing machines; wire and annular saws; semiconductor processing laboratories and a range of electronic and optical test equipment to study the properties of semiconductor materials; specialized packaging equipment for the manufacture of semiconductor devices; semiconductor class clean facility containing extensive facilities for photolithography, device processing and testing.

NATIONAL INSTITUTE FOR TELECOMMUNICATIONS RESEARCH (NITR)

P O Box 3718,
Johannesburg, 2000

Telephone: National (011) 648-1150/6
International + 27 11 648-1150/6
Telegrams: NAVORSTEL, Yeoville, 2198
Telex: 4-28089

Chief Director:	Mr R W Vice	X 232
Director, Development Programmes:	Mr H D Hölscher	X 250
Director, Space Programmes:	Mr W J Botha	Tel. (012) 26-5271 (011) 642-4693
Director, Radio Astronomy Programmes:	Dr G D Nicolson	Tel. (012) 26-5229 (011) 642-4692
Institute Secretary:	Mr W D Coetsee	X 233
Information and Liaison:	Mr F W R Potgieter	X 245
Total staff:	126	

Functions: The Institute was established in 1946 as the Telecommunications Research Laboratory of the CSIR to investigate radio and radar problems in some way unique to southern Africa. Interests include all aspects of radio science and are not confined to radio communication. Its research programme is determined under the guidance of the Telecommunications Advisory Committee, under the chairmanship of a Deputy President of the CSIR.
Activities include ionospheric research; study of the radiation and propagation of radio waves; monthly forecasts of propagation conditions for high-frequency radio waves; study of lightning and rain precipitation by means of radio and radar; development of electromagnetic systems for distance measurement and position fixing; study of advanced techniques in radio and radar; research and development aspects of defence radar and telecommunications; radio astronomy; satellite tracking and remote sensing.

The Institute's central research laboratories are situated in Observatory, Johannesburg. Several field stations are controlled from the central laboratory. The Radio Space Research Station is located at Hartebeesthoek, Transvaal, and comprises the Radio Astronomy Observatory and the Satellite Remote Sensing Centre. The Institute operates an experimental Meteorological Radar Facility at Houtkoppen, near Johannesburg, in collaboration with the National Physical Research Laboratory. An Antenna Test Range at Paardefontein, 40 km north-east of Pretoria, is operated by the Institute as a national facility to test and calibrate antennas. The site is also used for launching and communicating with instrument-carrying high-altitude balloons. A field station at Nietgedacht, north-west of Johannesburg, is used for a lightning research programme. Ionospheric observing stations are operated near Johannesburg, near Tsumeb and at Hermanus.

Regular publications: *Radio Propagation Predictions for Southern Africa,* monthly.
Bulletin of Ionospheric Characteristics recorded at Johannesburg and Hermanus, monthly.

RADIO ASTRONOMY OBSERVATORY

Director,
Radio Astronomy
Programmes: Dr G D Nicolson

Telephone: National (012) 26-5229
(011) 642-4692
International + 27 12 26-5229
+ 27 11 642-4692
Telex: 3-21006

This is a national facility, part of the observing time being available to users outside the CSIR.

Facilities: 26 m radio telescope with its associated radiometric receivers.

SATELLITE REMOTE SENSING CENTRE (SRSC)

Director,
Space Programme: Mr W J Botha

Telephone: National (012) 26-5271
(011) 642-4693
International + 27 12 26-5271
+ 27 11 642-4693
Telex: 3-21005

The Centre is a national facility for the reception and processing of satellite data concerning the earth's surface and atmosphere. This information is used by a wide spectrum of research and service organizations in southern Africa and elsewhere. Extensive modifications of the equipment and software programmes were carried out to increase the Centre's working capacity.

Special facilities: Parabolic antennas of 12 m, 10 m and 6,1 m; line scan processing system; image analysis system.

NATIONAL INSTITUTE FOR TRANSPORT AND ROAD RESEARCH (NITRR)

Scientia, Pretoria
P O Box 395, Pretoria, 0001

Telephone: National (012) 86-9211
International + 27 12 86-9211
Telegrams: NAVORSPAD
Telex: 3-21312SA

Chief Director:	Dr S H Kühn	X 2958
Director:	Dr G L Dehlen	X 2337
Director:	Mr R N Walker	X 2963
Director:	Dr J R Odendaal	X 3900

Institute Secretary: Mr B J Whyte X 2960
Total staff: 309

Functions: The Institute's research is aimed primarily at finding practical solutions to problems concerning transportation, road construction and road safety.

In the field of transportation, attention is given, *inter alia*, to the relation between transport and land use, Black commuters, the marketing of public transport, and the cost structure of alternative modes of transportation; the development of optimum geometric standards for South African rural road conditions; and low-cost methods of urban traffic improvement.

In the field of road construction, studies are made of road materials (natural and treated with cement or bitumen); earth structures (such as cuttings and fills); pavement design; and maintenance procedures; techniques and apparatus are developed to control construction processes.

Road safety research includes the statistical quantification of the road safety situation; assessment of the effectiveness of measures applied to improve safety; consideration of road-user aspects (such as practical driving tests, law enforcement, and accident case studies); and vehicle, road and traffic aspects related to safety.

The Institute works in close association with the national and provincial road and transport authorities, the South African Transport Services, industry, the South West Africa Administration, and others. These authorities provide the largest proportion of the Institute's research funds.

Research Application and Information Group

Head: Mr G J van N Fourie X 2981

Promotes the practical application of research findings by means of publications, films, courses, symposia and conferences, and also by direct replies to enquiries; arranges programmes for visitors, maintains technical liaison, liaison with the mass media, and an information centre which stores and provides information keeping researchers and road engineers throughout southern Africa informed of the latest developments.

Special facility: A computerized system for information storage and retrieval.

TRANSPORTATION BRANCH

Branch Head: Dr G L Dehlen X 2337

Studies urban, intercity, and rural transport of people and goods by various modes, concentrating on financing, planning, some aspects of design, and operation of roads and public transport; rail and air transport are also studied.

Urban Transport Group

Head: Mr J W M Cameron X 2892

Three sections of which the first identifies transport problems and needs, particularly in the area of Black commuting; the second undertakes transport planning and transport operations, particularly the marketing of public transport and planning procedure and models; the third covers land use and the role of transport in development.

Traffic Engineering Group

Head: Mr A B Tomecki X 3585

Improves traffic flow quality, mainly on urban roads; assesses the consequences of various traffic engineering measures; current and completed projects: bus priorities, parking policies, application of computers in traffic control, urban traffic engineering, traffic aspects of road policies, transportation system management, and capacity studies.

Transport Economics Group

Head: Dr P J D du Toit X 3573

The economic allocation of transport resources for all the different modes, viz. road, rail, air, sea and pipelines; the economic evaluation of transport projects and the underlying data pertaining to planning, construction, maintenance, operation, evaluation of users' time and accident costs; statistics on all these and related subjects are collated and published regularly.

Rural Transport Group

Head: Dr C J Bester X 2917

Development of a methodology for the analysis of rural transport needs, the planning of rural roads in South Africa, the establishment of priorities for proposed investments in rural transport and drawing up optimum geometric standards for South African roads; carries out a long-term road-planning project which, it is hoped, will result in a series of guideline documents on topics relevant to the field of rural road planning.

ROADS BRANCH

Assistant Branch Head: Dr C P Marais X 2966

Coordinates all research and special consultation by the Institute on road construction and maintenance; maintains close liaison with the road authorities of South Africa; promotes the implementation of the Institute's research findings on natural construction materials, soil engineering, organic and inorganic binders, pavement design, road construction and road network maintenance.

Soil Engineering Group

Head: Dr F Netterberg X 2918

Investigates the geographic distribution and road building properties of both fresh and weathered rock and draws up guides on its use; studies the influence of soluble salts in road foundations and develops methods of minimizing their undesirable effects; studies design and construction procedures of high embankments with a view to preparing recommendations for use in practice; undertakes research on the influence of water on road foundations; develops expansive clay subgrades and laboratory test methods.

Special facilities: 750 mm earth auger; X-ray diffraction equipment; Differential Thermal Analysis (DTA) and microscopes; deep-sounding equipment; shallow seismic and resistivity apparatus; triaxial, shearbox and oedometer (75 and 150) apparatus.

Pavement Engineering Group

Head: Dr C R Freeme X 2944

Develops improved procedures for the design of road pavements with untreated, cement-treated and bitumen-treated bases and formulates design recommendations; develops methods of measuring and predicting the axle load distribution of vehicles; studies the influence of traffic (including abnormally heavy vehicles) on roads; gives attention to lightly trafficked roads and urban roads as well as interurban and rural roads; plans and controls the construction of experimental roads; evaluates the performance of these and other roads under traffic; provides road authorities with axle mass surveys.

Special facilities: Mobile Heavy Vehicle Simulators; depth deflectometers; strain meters; pressure cells; automatic dataloggers; TAWC equipment for axle mass surveys, coring machine.

Maintenance and Construction Group

Head: Dr C P Marais X 2966

Studies the maintenance of roads and techniques of road construction; studies and interprets information on deflection and radius of curvature with a view to providing pavement overlays for South African conditions; develops methods and equipment to measure the level of road service; studies pavement rehabilitation methods, including recycling; keeps abreast of developments in the field of concrete pavement construction; provides riding quality, skid resistance and deflection services to road authorities.

Special facilities: Profilometers; Lacroix deflectograph; SCRIM apparatus for skid resistance determination.

Bridges Group

Head: Dr M A G Duncan X 2945

Conducts research into the analysis of bridge structures, mainly involving the development of computer programs.

Pavement Management Group

Head: Mr P C Curtayne X 3490

In order to maintain established road networks in an efficient and systematic manner, draws up and tests systems for the monitoring of roads in a network, for storing and processing data for planning purposes, and for coordinating maintenance activities.

Special facilities: Photologger.

SAFETY BRANCH

Branch Head: Dr J R Odendaal X 3900

Coordinates all road safety research done by the Institute and maintains liaison with the National Institute for Personnel Research of the HSRC on work concerning both Institutes; promotes the implementation of the Institute's road safety research findings through the National Road Safety Council and road authorities.

Safety Analysis Group

Head: Mr H B Pretorius X 3918

Develops appropriate procedures for the collection and analysis of traffic safety data; carries out field surveys and analyses information from various sources to quantify the accident situation; measures the effectiveness of applied traffic safety measures; assists road safety authorities in decision-making; supports other Groups by designing and analysing their surveys and experiments. Since 1981 is building up a country-wide network of teams to introduce a national accident sampling system by means of case studies and to aid in field surveys; runs a traffic safety data bank.

Special facilities: Traffic engineering loggers; speed distribution meters; historical accident, traffic flow and traffic speed data banks; a mobile video survey laboratory equipped with closed-circuit time-lapse television equipment; vehicles fitted with two-way radio facilities to maintain contact with the police.

Road Users Group

Head: Mr R K Deppe X 3906

Investigates various aspects of accidents involving pedestrians, cyclists and problem drivers, as well as possible counter-measures for such accidents;

studies traffic control policies, traffic law enforcement procedures and problems experienced by traffic authorities; investigates safety conditions in specific problem areas; since 1981 attention is being given to the problem of air safety (civil aviation).

Special facilities: Alcohol breath-testing equipment; conventional and time-lapse video recorders.

Safety Engineering Group

Head: Mr R Fieldwick X 3934

Studies the influence of the geometric design of roads, the presence of roadside hazards, the layout of the road network, and traffic control, speed limits and pedestrian measures on traffic safety in order to ensure increased safety through improved road design standards, specifications and warrants, and through better guidance and traffic control; investigates the extent of traffic noise on properties adjacent to freeways and major arterials; studies methods of predicting and combating road traffic noise.

Special facilities: Noise measuring and analysing instrumentation; equipment for collecting traffic data automatically.

Vehicle Safety Group

Head: Mr J C Hillman X 3913

Investigates and evaluates methods of improving the safety of all types of vehicles from heavy commercials to pedal cycles and tractors, including investigating safety related vehicle hardware, such as braking systems, under-ride protectors and bus occupant protection, as well as developing methods of improving operating safety in the fields of hazardous chemical transportation and vehicle conspicuity; current projects include tests on the skid resistance of truck tyres, development of a motorcycle running light and investigation of bus safety standards.

Special facilities: A spectrometer for the measurement of luminance, illumination light polarization and colour; a dropside truck with instrumentation to measure braking performance and skid resistance of tyres; an impact pendulum for testing vehicle structures.

TRANSPORT INFORMATION BUREAU

General Manager: Adv. T J Botha X 4319

The Bureau is housed at and administered by the Institute on behalf of the traffic authorities of South Africa. Detailed information on vehicle ownership, driver's licences, accidents, and convictions is collected, stored and processed for purposes of traffic administration. The Bureau conducts negotiations toward the establishment of a coordinated data bank for all Southern African states and investigates a new driver's licence system for the RSA.

NATIONAL INSTITUTE FOR WATER RESEARCH (NIWR)

Scientia, Pretoria
P O Box 395, Pretoria, 0001

Telephone: National (012) 86-9211
International + 27 12 86-9211
Telegrams: NAVORSWAT
Telex: 3-21312SA

Chief Director:	Dr D F Toerien	X 2237
Director:	Dr L R J van Vuuren	X 2245
Assistant Directors:	Dr J Hemens	Tel. (031) 25-5531
	Mr W R Ross	(021) 97-6181
Institute Secretary:	Mr L P Vorster	x 2244
Liaison Officer:	Mr P Coombs	X 2231
Total staff:	205	

Functions: Formerly the Water Research Division of the National Chemical Research Laboratory, the NIWR became an institute of the CSIR in 1958, and now has six research divisions and three regional laboratories. The Institute conducts basic and applied research on a contract basis for industries, local authorities, provincial administrations and government departments.

Limnology Division

Head: Dr F M Chutter X 3173

Applied limnology; functioning of eutrophic impoundments; impoundment management; river conservation status; biotic indices; pollution; impact of acid rain; problem organisms (toxic blue-green algae, biting flies); diatom taxonomy.

Water Quality Division

Head: Dr W O K Grabow X 3949

Routine analytical services on 22 sanitary water quality parameters in respect of *inter alia* 15 metals, total and organic carbon, organohalides, pesticides and organic residues; research on the chemical and microbiological aspects of conventional and reclaimed drinking water supplies and on the efficacy of wastewater purification processes; research on microbiological quality standards including study of pathogenic and indicator bacteria, bacteriophages, enteric viruses, hepatitis viruses and intestinal parasites; research on biological methods for monitoring water quality includes study of continuous-flow fish test systems and procedures in which bacteria, protozoa, mammalian cell cultures and enzymes are used to detect toxic substances and potential carcinogens.

Special facilities: Auto-analysers, Beckman carbon apparatus; infrared and ultraviolet spectrophotometers; gas chromatograph mass spectrometer system; atomic absorption spectrophotometers; computer facilities; laboratories for advanced fish and microbiological research.

Biotechnology Division

Head: Mr A Gerber X 2271

Fundamental and applied research into various aspects of microbiology, biochemistry and the technology of biological wastewater treatment systems; removal of nitrogen and phosphorus compounds from wastewater by means of modified activated sludge processes; nutrient recovery by means of algae culture in wastewater ponds; mathematical modelling of biological purification processes; advisory services regarding the design of biological treatment systems.

Daspoort Experimental Station (DES) (012) 26-8097/8

The Station, which forms part of this Division, caters for pilot plant investigations required for research projects in the Institute. Activities include: research on integrated chemical, physical and biolgical systems for wastewater treatment; laboratory and pilot scale algae production; carbon adsorption; biological phosphate and nitrogen removal; slow sand filters and fish production in wastewater; routine analytical services.

Special facilities: Constant temperature rooms; continuous-culture apparatus; experimental nutrient-removing prototypes; pilot plants; fish production ponds; equipment for processing algae harvested from shallow ponds.

Physical-Chemical Technology Division

Head: Dr B M van Vliet X 2270

Advanced purification of sewage and biologically treated sewage effluents by physical-chemical methods (coagulation, flotation, disinfection, ozonation, adsorption, etc.) with special reference to domestic use; studies and advises on water and effluent management by industry.

Special facilities: Pilot facilities for studies of adsorbents, adsorption techniques and activated carbon regeneration; thermogravimetric and differential thermal analysis equipment; surface area, pore size distribution and abrasion propensity measurement equipment; pilot units for industrial effluent treatment.

Technological Application Division

Head: Mr R J L C Drews X 2273

Provides government departments, provincial administrations, local authorities, industries and individuals with information and advice on water purification and treatment of effluents; studies the removal of undesirable substances from polluted waters used as sources of supply for conventional water treatment plants and chemical aspects of water purification; advises on the planning and operation of water and wastewater treatment plants in the national and independent states; assists with the training programmes for operators in these areas.

Advisory Services: Water Care

Head: Mr J S Wium X 2283

REGIONAL LABORATORIES

Natal Regional Laboratory

King George V Avenue, Durban
P O Box 17001, Congella, 4013

Telephone: (031) 25-5531 x 13
Telegrams: NAVORS, Durban
Telex: 6-22431

Head: Dr J Hemens

Monitors pollution along the east coast of South Africa and ecological effects of marine and estuarine disposal of urban and industrial wastes; studies movement and accumulation of nutrients and pollutants in estuaries; maintains surveillance of bacterial quality of recreational beaches; develops and uses bioassay methods for toxicity in seawater; studies conversion of wastewater nutrients into useful products; undertakes mathematical modelling of quality parameters in Natal rivers; studies quality of stormwater runoff in relation to land use; studies limnological characteristics and nutrient budgets of Natal impoundments in relation to eutrophication effects; provides advisory services on water and wastewater treatment to provincial and local authorities and to industries.

Cape Regional Laboratory

East Street, Bellville
P O Box 109, Sanlamhof, 7532

Telephone: (021) 97-6181/5
Telegrams: NAVORS, Cape Town
Telex: 57-27819

Head: Mr W R Ross

Studies aspects of solid waste management, such as the composing of refuse and sewage sludge, land application of sewage sludge, characterization of municipal sludges and the development of methods to combat insect and odour nuisance conditions arising from the disposal of liquid and solid wastes; investigates the utilization and artificial recharge of groundwater supplies in the sand beds of Atlantis and in the Cape Flats and the desalination of reclaimed water by reverse osmosis; studies the application of anaerobic digestion to the treatment of various kinds of organic industrial wastes; and renders advisory services to the Cape Provincial Administration, local authorities and industries.

Orange Free State Regional Laboratory

P O Box 12053, Brandhof, 9324

Telephone: (051) 8-8250

Head: Mr P T Viljoen

Renders advisory services and undertakes *ad hoc* investigations for the Orange Free State Provincial Administration and various local authorities

including qualtitative surveys of groundwater sources for municipalities and selected smallholdings in the Province; monitors municipal water and sewage treatment and preparing manuals for each treatment plant to ensure more effective and economical treatment; monitors municipal surface sources for harmful constituents including insecticides and pesticides and investigates ways of removing them; investigates disposal of industrial effluents and optimum use of water in industries.

NATIONAL MECHANICAL ENGINEERING RESEARCH INSTITUTE (NMERI)

Scientia, Pretoria
P O Box 395, Pretoria, 0001

Telephone: National (012) 86-9211
International + 27 12 86-9211
Telegrams: NAVORSMEG

Chief Director:	Dr M S Hunt	X 2127
Deputy Director:	Mr A H van Tonder	X 3286
Deputy Director:	Mr W L van Heerden	X 2128
Head of Administration:	Mr W J Vos	X 2112
Funds:	Approximately R6,5 million	
Total staff:	200	
Research and technical staff:	123	

Functions: Mainly to develop new concepts and techniques in mechanical engineering and to improve machines and materials used in industry, specifically in the fields of design, strength of structures, process development, geomechanics, fluid mechanics, aeromechanics, heat mechanics (including air-conditioning and refrigeration) and production engineering.

All the divisions as well as the Production Engineering Advisory Services Unit are housed at Scientia in Pretoria, while the Mine Equipment Research Unit is at Cottesloe in Johannesburg.

Design and Development Division

Acting Head: Mr A H van Tonder X 3286

Provides a centre of expertise in the field of advanced design techniques and development; provides services to industry and research centres throughout South Africa; and makes available design-related information through a computerized indexing system; develops special purpose equipment; performs selected finite element analyses as an aid to structural machinery design; undertakes research on the application of composite materials, orthopaedic surgical implants and hydrostatic transmissions for electric vehicles.

Special facilities: Composite materials laboratory and workshop; stationary test bench for the testing of hydraulic components; high-temperature furnace with inert atmosphere for carbon reinforced carbon research.

Strength Mechanics Division

Head: Mr M N van Zyl X 2111

Solves stress analysis problems, theoretically, by finite element methods, and experimentally, with the aid of strain gauges; conducts basic research into metal fatigue caused by variable frequency and amplitude of stress, size and shape of trial components such as rails, steel castings, bolted connections and automotive components; investigates failures in practice and the strength of materials in general; advises on engineering dynamics, especially balancing and vibration problems.

Special facilities: a 300 m polariscope and ancillary equipment for two-dimensional stress analysis; fatigue testing equipment, including a testing floor of 5,5 m x 16 m for MN loads; 100 kN and 20 kN high-frequency vibrophores; 50 kN Sonntag and Krouse machines; universal testing equipment including 500 kN Amsler, 200 kN Amsler and 100 kN Mohr and Federhaff testing machines; facilities for creep testing; 50 kN Instron high-temperature static testing machine; pendulum impact machine; comprehensive static and multichannel dynamic straingauge equipment; vibration testing facilities; high-speed impact testing facilities; 100 kN, 200 kN and 1 000 kN servo-hydraulic testing machines for the simulation of any loading spectrum or accurately controlled load deformation rates; minicomputer for fast data processing and the analysis of fatigue-inducing loading spectra; two real time spectrum analysers.

Geomechanics Division

Head: Mr W L van Heerden X 2128
Deputy Head: Mr U W Vogler X 2140

Provides research support for the civil and mining engineering industries; carries out research into the behaviour of rock and rock masses, the application of geophysical methods to rock mechanics and mining, and the stability of excavations in rock such as slopes, tunnels, caverns, open cut and underground mines.

Special facilities: For field testing - Apparatus for measuring stress in rock; single- and 12-channel seismographs; Goodman jack and large flat jack testing equipment for modulus determination of rock masses; convergence measuring devices, extensometers and pressure cell equipment for monitoring purposes.

For laboratory testing - Equipment for testing rock properties under uniaxial and triaxial loads (both in compression and tension); equipment for the determination of dynamic deformation moduli; ultra-high speed camera for the photography of fracture development in rock (1,5 million frames per second); biaxial model testing machine (capacity 1 MN); Moiré bench for the determination of displacement distribution in models of fractured rock; polarizing microscope and slide preparation equipment for petrographic studies; high-rate loading machine (capacity 5 MN); universal specimen preparation cutting and polishing machine for large rock specimens (maximum specimen size 450 mm); compression loading machines (with automatic servo-control unit, ranging from 40 kN to 2 MN); a 'creep'

testing machine (maximum loading capacity 150 kN); photoelastic polariscope (loading capacity 6,5 kN horizontal and vertical, 300 mm diameter lenses); reflection polariscope; constant rate of strain shear box for rock and soil testing; centrifuge (acceleration 1 200 g max, model mass up to 35 kg, equipped with ovens for stress freezing of plastoelastic models); rock bolt testing devices; equipment for testing swelling properties of rock.

Fluid Mechanics Division

Head: Mr A H van Tonder X 3286

Investigates fluid flow phenomena such as discharge coefficients of bends and valves and uniform flow velocities through electrostatic precipitators; investigates processing and comminution of materials and measures particle sizes in materials; undertakes extensive investigations in the field of hydraulic and pneumatic transportation of solids; undertakes model studies of river diversion, automatic irrigation gates, pump inlet bays and hydraulic structures.

Special facilities: Hydraulics laboratory: Capillary tube and rotational viscometers; 38, 100, 200 and 250 mm diameter pipeline circuits for hydraulic transportation studies; 100 mm diameter pipe test loop for pneumatic transportation of solids; 100 mm diameter pipeline circuit used with a Schwing pump for testing high concentration solid transportation; test area for hydraulic model studies of rivers; 1,2 m x 1,2 m flume with a flow of 0,4 m^3/s; fire safe test rig for valves; flow visualization equipment.

Process labortory: Ball and rod mills with variable speeds for research on batch and continuous feed grinding processes; ultrarotor for pulverization of materials down to 4 m diameter; small particle measuring and sieve analysis instrumentation.

Heat Mechanics Division

Head: Dr A F B Johannsen X 2331

Undertakes applied research in the broad fields of thermodynamics, heat transfer and solar energy, and specifically in air-conditioning, including performance improvements and the development of computerized design methods; industrial refrigeration, particularly the chilling and freezing of meat; the use of solar energy for heating, cooling, drying and mechanical power generation; heat transfer and the optimization of heat exchangers; energy conservation, including heat recovery and heat pumps; Stirling engines; internal combustion engines, including alternative and supplementary fuels; as well as fuel-saving methods and devices.

Special facilities: Temperature and humidity-controlled wind-tunnel with chilled water, hot water and steam test circuits; experimental freezing/chilling room with ammonia refrigeration circuit; a range of engine dynamometers; oscilloscopes and pressure transducers for the measurement of oscillating pressures; air distribution laboratory; solar-powered air conditioning system; simulated office for comfort studies; spot welder for humidity, velocity and heat flow measuring and recording apparatus; microthermocouples; infrared camera; radiometers as well as computers and computerized data acquisition systems.

Aeromechanics Division

Head: Dr W J van der Elst X 2330

Undertakes research in the field of low-speed aerodynamics including research and development on wind energy machines; investigations into aerodynamic problems in connection with high-speed mineshaft conveyances; studies on drag of road and rail vehicles; and studies of air flow in mineshafts; carries out calibration of special airflow measuring instruments.

Special facilities: Low-speed wind tunnels; one with a working section of 7,5 m x 6,5 m maximum velocity 34 m/s, one with a working section of 2 m diameter, maximum velocity 30 m/s, and one with a working section of 0,6 m x 0,6 m for instrument calibration, maximum velocity 30 m/s; whirling arm (1,65 m diameter) for the accurate calibration of low-speed measuring probes; water tunnel with a working area of 0,6 m x 0,6 m in cross-section, suitable for flow visualization studies and general flow problems; a 26 m deep pit for testing dynamic scale models of mineshafts.

Tribology Division

Head: Mr J E Davies X 2136

Deals with the environmental and topographical problems which may arise in engineering involving joints, sliding and rotating parts, indentation, impacting and erosion and where relative motion may be a problem; undertakes investigations on an *ad hoc* basis or by contractual agreement.

Special facilities: Scanning electron microscope; microscopes; ferrograph; instrumentation for replication techniques and lubricant residue examinations.

MINE EQUIPMENT RESEARCH UNIT

Cottesloe, Johannesburg Telephone: (011) 726-7100/1/2/3

Head: Dr J T D Fritz

Conducts research into the fatigue and strength of steel winding ropes and the performance and strength of mining machinery, components and structures; undertakes tests of steel wire winding ropes and other industrial equipment in accordance with statutory requirements.

Special facilities: a 10 000 kN Mohr and Federhaff compression testing machine; 10 000 kN Avery Denison tensile rope testing machine (10 m bed); 5 000 kN Mohr and Federhaff tensile testing machine (30,5 m bed); 1 000 kN Amsler Universal testing machine (with pulsator for fatigue loading); 1 000 kN Amsler Universal testing machine; computerized data acquisition system for determination of stress-strain, loading-elongation and torque-tension properties of wire ropes and steel specimens; CSIR-designed machine for fatigue testing of large winding ropes under any combination of tensile, torsional and bending forces; CSIR-designed machine to determined

the torque-tension characteristics of winding rope; a number of smaller machines for the routine testing of wires; Rockwell and BRIVISKOP hardness testing machines for standard Brinell and Vickers tests; Krautkramer ultrasonic and magnetic particle test equipment for the non-destructive testing of components.

PRODUCTION ENGINEERING ADVISORY SERVICE (PEAS)

Acting Head: Mr J S Miller X 2499

Provides South African industry with advice, assistance and training in those areas where such facilities are inadequate or unsuitable; facilitates the transfer of technical knowledge by advising industry of the results of technological development, how and where to apply it and to encourage industry to use it.

A contract service to industry: designs and manufactures special purpose automatic or semi-automatic machines and equipment, which includes the construction of prototypes and pre-production models.

A machining technology service: develops and optimizes machining techniques, evaluates and improves cutting tools, evaluates cutting fluids and the machining characteristics of ferrous and non-ferrous alloys; provides a machining data service, solves machining problems *in situ*, and rationalizes of tooling systems; undertakes development work into cutting tool design.

An advisory service: advises on forming, fabrication and joining of materials and improved production techniques in these fields.

CAD/CAM systems and robotics: provides advice on the application of computer-aided design and manufacturing systems.

Production systems studies: undertakes practical investigations in companies and provides solutions to organizational production problems such as work flow, factory layout, component handling, process capability, production control, quality assurance and production economics.

Industrial training courses: presents a series of short intensive training courses to industry; runs special in-house courses where necessary; produces video training films which are avilable for sale or hire, to supplement the training courses; furthers technology transfer through the organization and presentation of monthly seminars and workshops.

Special facilities: Kestler dynamometers; 2-3DCAD/CAM terminals; scanning electron microscope; cutting tool geometry measuring machines; metal optics machining facility; cutting tool evaluation laboratory; 5-axis robot; microcomputers, machining data bank; video camera and recording equipment.

NATIONAL PHYSICAL RESEARCH LABORATORY (NPRL)

Scientia, Pretoria
P O Box 395, Pretoria, 0001

Telephone: National (012) 86-9211
International + 27 12 86-9211
Telegrams: NAVORSFIS

Chief Director:	Dr J S V van Zijl	X 3455
Director:	Dr G J Ritter	X 2391
Institute Secretary:	Mr J J Rosin	X 3454
Liaison Officer:	Mrs N Basson	X 2395
Total staff:	192	

Functions: Activities are largely determined by the country's needs. Research and development is undertaken in various fields of the natural sciences such as optics, solid state physics, geophysics, acoustics, geochronology and atmospheric physics. This research is mostly application orientated, but fundamental research is also undertaken. In addition, the NPRL has statutory responsibility in terms of Act 76 of 1973 for the maintenance of the national measuring standards of mass, length, time, temperature, electricity, light, pressure, force and ionizing radiations.

GENERAL PHYSICS GROUP

Optical Sciences Division

Head: Dr M W McDowell X 3418, 3403

Studies optical design techniques and designs and manufactures prototype optical and electro-optical systems of an advanced nature; studies and analyses the fundamental image formation properties of optical components and systems; develops the technology of optical thin films; studies the optical and mechanical properties of thin layers; manufactures various items such as laser mirrors and edge filters; investigates and develops a variety of laser systems such as dye lasers, CO_2 lasers, metal vapour and solid state Nd:YAG lasers, which are applied in fields such as non-linear frequency shifting and gas flow dynamics; studies various aspects of optical materials, in particular their processing, photo-electric and associated properties and application; studies optical remote sensing techniques including digital image processing and applications of satellite data.

Special facilities: Well-equipped optical workshop; modern equipment for optics research, e.g. apparatus for the determination of optical transfer functions, evaporation systems and accessories for thin film studies; spectrometers and spectrographs; high-power continuously tunable dye lasers; CO_2 and optically pumped solid state lasers; modern digital image processing and display facilities.

Physical Acoustics Division

Head: Dr F Anderson X 3346, 3348

- Speech research - investigations of objective methods for determining the speech intelligibility of acoustic and electro-acoustic systems; development of a method to transform certain acoustic parameters of speech, such as pitch and rhythm, into visual images; research into and development of teaching aids for children with speech and hearing defects.
- Measurement of acoustic power - development and production of instrumentation to measure sound power directly instead of deducing it from measurements of sound pressure; investigation of the applications of this system of measurement to basic acoustical processes and the development of automatic facilities for evaluating the acoustic parameters of materials and equipment.
- Shark barrier - investigation of a method of repelling sharks by setting up an electric field in the water around bathing areas in the sea.

The Division is responsible for setting and maintaining the South African standards for sound pressure, vibration and ultrasonic non-destructive material testing, as well as for the calibration of similar equipment belonging to other organizations.

Special facilities (also at the disposal of other CSIR institutes and outside users): Reverberation, anechoic and sound transmission rooms; standard acoustic measuring instruments; computer and automatic plotting facilities for the Fourier analysis of wave forms such as speech and for the determination of the transfer functions of complex electric or acoustic systems such as filters and loudspeakers.

National Measuring Standards and Metrology Division

Head: Dr R Turner X 3439, 3006, 3388

Development of methods for the precise measurement of length, mass, force, pressure, ionizing radiations, time, temperature, light and electricity; maintenance of national measuring standards; development of physical methods for comparison of standards and for calibration of secondary standards and construction of the appropriate apparatus. The work is partly aimed at establishing new international standards.

The Division also runs the National Calibration Service and investigates new techniques in engineering metrology.

Special facilities: Interferometer for the absolute determination of lengths up to 20 cm; laser interferometer for the calibration of tapes over a distance of 50 m; standardizing balances with accuracy as high as one part in one hundred million for measurements up to 20 kg; primary barometer with accuracy within 1 pascal; resistance bridges, platinum thermometers and thermocouples for temperature measurement; primary pyrometer for temperature measurements in regions above 800 °C; absolute radiometer to measure the intensity of light; standard lamps and integrating sphere photometer; facilities to maintain standards of voltage and resistance and to

measure voltage, resistance, current, inductance and capacitance at a.c. and d.c.; standard caesium clock and facilities to produce a time-signal for broadcasting throughout the country; X-ray and sources and ionization chambers, dosimeters, etc. to determine doses of ionizing radiations.

EARTH AND ATMOSPHERIC SCIENCES GROUP

Atmospheric Sciences Division

Head: Dr D v d S Roos X 2893, 2894

- Cloud physics - studies of various aspects of the physics of clouds, rain, hail and lightning including the internal structures of hailstones in relation to surface patterns and the radar reflectivity of hailstorms, and the growth of artificial hailstones in a small wind tunnel by accretion of supercooled water droplets.
- Air pollution - multidisciplinary research aimed at determining the nature and extent of air pollution in South Africa. Specific pollutants are monitored on a local, regional and hemispheric scale in order to establish trends and to study the underlying physical and chemical processes associated with pollutants in the atmosphere. The private and public sectors of the community are assisted with and advised on the control of and planning against air pollution.
- Current projects - detailed case studies of individual hailstorms; development of hail measuring instruments; mathematical techniques for determining the dispersion and removal of pollutants from the atmosphere and for modelling wind and temperature fields; micro- and mesometeorological investigations aimed at the effective planning of new industrial and urban areas; the national survey of smoke and sulphur dioxide; identification and measurement of organic substances and trace elements in the atmosphere; studies of the interactions of dry-cooling systems at coal-fired power stations and the ambient atmosphere; and the development of improved instrumentation for atmospheric research.

Special facilities: Cold laboratory with temperature adjustment down to 30 °C; high-power, high-resolution weather radar for storm studies; mobile laboratories to measure pollutants from motor vehicles and smoke, sulphur dioxide and trace elements; acoustic sounders and balloon-borne instrumentation for wind and temperature measurements; atomic absorption spectrophotometer; computer-controlled gas chromatograph/mass spectrometer, correlation spectrometer.

Geochronology Division

Head: Dr U Schärer X 3410, 3434

Determines the isotopic composition and geological ages of rocks and minerals by uranium-lead, lead-lead, rubidium-strontium and samarium-neodymium methods; undertakes uranium-lead studies of zircon from a wide variety of South African and Namibian rock types to aid the correlation of formations in unknown areas with those from known, well-proven mineral provinces in terms of the age and genesis; studies fundamental problems

by means of the rubidium-strontium method; lead-lead and samarium-neodymium methods will be applied to detailed investigations of local geological problems; undertakes basic research projects, investigations in collaboration with South African universities, service orientated contract work for the Geological Surveys of the Republic of South Africa and Namibia as well as for mining companies on an *ad hoc* basis.

Special facilities: three mass spectrometers: the latest VG 354, a Micromass MM 30 and a modified TH 5 Varian Mat. Special features of the VG 354 instrument include fully computer-controlled operation and data processing, and a multicollector analyser array enabling five different isotopic mass units to be monitored simultaneously. A full range of rock crushing and mineral separation facilities are available. Chemical processing of rocks and minerals is done in ultra-clean laboratories.

Geophysics Division

Head: Dr J H de Beer X 3736, 3675

Develops and improves groundwater hydrology, oil exploration, civil engineering and mining techniques with emphasis on geoelectrical and seismic methods; carries out research on the structure and evolution of the crust and upper mantle of the earth by means of geoelectrical, electromagnetic, geomagnetic and magnetotelluric deep soundings.

Current projects include investigations into the relationship between geophysical parameters and the hydrological characteristics of aquifers; development of theory and apparatus that can be applied in mining geophysics; electrical resistivity studies in the Namaqua-Natal Province, Archaean Greenstone terrains and the Bushveld Complex; correlation of geoelectrical parameters of the crust with other geophysical parameters; tectonic interpretation of results.

Special facilities: Equipment to carry out shallow and deep geoelectrical surveys, seismic refraction, gravity, magnetic and geomagnetic array studies; specialized borehole logging equipment (gamma, gamma-gamma, neutron and electrical resistivity) to determine hydrogeological parameters in boreholes; computer programs for the calculation of theoretical models and the reduction and interpretation of field data.

Natural Isotopes Division

Head: Dr J C Vogel X 3380, 3401

Radiocarbon dating; the application of naturally occurring radiocarbon and titrium and the lighter stable isotopes ^{13}C, ^{18}O and ^{15}N to geophysical problems such as groundwater hydrology, meteorology, and oceanography; uranium series isotopes are measured with applications in hydrology, mineral exploration and the dating of Pleistocene deposits.

Special facilities: Mass spectrometers for accurate isotope ratio measurements of the light elements; infrared carbon dioxide analyser, low-level counting equipment for radiocarbon, titrium and uranium series isotopes; underground low-level counting laboratory.

NATIONAL RESEARCH INSTITUTE FOR MATHEMATICAL SCIENCES (NRIMS)

Scientia, Pretoria
P O Box 395, Pretoria, 0001

Telephone: National (012) 86-9211
International + 27 12 86-9211
Telegrams: NAVORSWISK

Chief Director:	Dr D H Martin	X 3030
Director:	Mr P P Roets	X 4185
Institute Secretary:	Mr A J de Klerk	X 3029
Total staff:	96	

Functions: The Institute, which was established in 1961, investigates and develops new mathematical and statistical theories and computer methods and applies mathematics to a large variety of technical, physical, socio-economic and management problems. In addition to its basic research, the Institute renders research-oriented services to industry, government departments and other organizations.

Research publications: Research reports (with abstracts) and articles that have recently been published in scientific journals are listed in *NRIMS Current Activities* which is issued quarterly and is available free to interested persons and organizations.

Mathematics and Dynamic Meteorology Division

Head: Dr Y Yavin X 3022

Theory and practice of optimization; the control of deterministic and stochastic systems; optimal control; differential games, estimation and filtering; categorical and algebraic systems theory; theory of differential equations; meteorological models, numerical weather prediction and simulation of cloud dynamics.

Operations Research and Statistics Division

Head: Dr L P Fatti X 3051

Analysis and simulation of large dynamic systems with applications in planning problems; decision theory, stochastic dynamic programming and search theory; multiple criteria decision analysis; interactive decision support systems; theoretical aspects of mathematical statistics, especially in the fields of discrete and continuous multivariate analysis, regression, outlier theory, geostatistics, distribution theory and time series analysis; consultation in connection with problems arising in the biological, medical and physical sciences, as well as econometrics.

Numerical and Applied Mathematics Division

Head: Dr H G Miller X 3014

Numerical solution of integral equations; analysis of convergence of numerical methods; the study and evaluation of numerical quadrature formulae; numerical treatment of ordinary and partial differential equations; finite element methods; formulation and solution of quantitative problems in technology.

Computer Science Division

Head: Mr P P Roets X 4185

Designs and develops control software for small computer systems; develops programming languages, techniques and aids; researches and develops data banks and information systems; investigates numerical control of machine tools, computer graphics and kinematics, and interactive computing with application to cartography.

Special facilities: Interconnected Perkin-Elmer 3250XP and 3220 computer systems; 400 mB disk storage; 1600/800 BPI tape drive; Tektronix GMA 102, 4014 IKONAS RD 3000 raster colour and HP 2648 graphics terminals; 0,1 mm resolution digitizer table.

Theroretical Physics Division

Head: Dr H G Miller X3008

Research into nuclear structure calculations, few- and many-body problems, intermediate energy physics, and computational physics; theoretical support is provided to other physicists at the CSIR.

NATIONAL RESEARCH INSTITUTE FOR OCEANOLOGY (NRIO)

P O Box 320,
Stellenbosch, 7600

Telephone: National (02231) 7-1010
International + 27 2231 7-1010
Telegrams: NAVORSEE, Stellenbosch
Telex: 5727126

Chief Director:	Mr F P Anderson	X 240
Director (Contracts and Services):	Mr C C Stavropoulos	X 241
Deputy Director (Marine Sciences):	Dr A E F Heydorn	X 280
Deputy Director (Coastal Engineering and Hydraulics):	Mr K S Russell	X 243
Institute Secretary:	Mr A A L Beneke	
Total Staff:	170	

Functions: The Institute was established in 1974 to take over and combine existing CSIR activities in marine science and technology, and to provide appropriate professional, technical and logistic advice, assistance and support to South African and foreign organizations for their work in the coastal areas around South Africa.

The Institute's administrative headquarters, its research and support divisions, as well as the South African Data Centre for Oceanography and the Estuarine and Coastal Research Unit (ECRU), are located in Stellenbosch.

Special facilities:
The *Meiring Naudé*, the Institute's research vessel, operates from Durban, where a ship support group is housed in the CSIR's regional laboratories.
Ski- and other boats are housed at Stellenbosch.

MARINE SCIENCE DIVISIONS

Deputy Director
(Marine Sciences): Dr A E F Heydorn X 244

Physical Oceanography Division

Head: Dr M L Gründlingh X 360

Investigations into the environment of the oceans around South Africa; studies of the nature and origin of the Agulhas Current; further off-shore studies of meso-scale vortices which are an important part of the general circulation of the southwest Indian Ocean; investigations into the dynamics and influence of the Agulhas Current as it meanders and forms eddies on the shelf edge (as part of the multidisciplinary Agulhas Bank studies); investigations into aspects of the Southern Ocean, such as Agulhas Current retroflexion, the major convergent zones and the scales of motion involved; studies of the interaction between atmosphere and ocean and between ocean and climate and of the synoptic scale meteorology of the Cape south coast; collection and analysis of environmental data under contract.

Facilities: Research ships, moored arrays of meters, drifting buoys and satellite imagery are used to gather data and sophisticated methods of analysis are used to compile and interpret the data.

Marine Biology Division

Head: Dr R A Carter X 290

Fundamental research into the ecology of pelagic and benthic environments in the seas bordering South Africa. Research is concentrated on the Agulhas Bank region and includes investigations into plankton dynamics associated with the seasonal development of strong thermoclines and the relationship between plankton and spawning anchovy on the Agulhas Bank; macro and meiofauna of the various types of soft substrata, e.g. sand, sandy mud, and mud found on the Agulhas Bank, and benthos/water column relationships; community structure of reefs and rocky shores of the Agulhas Bank region; investigations into the energetics of the Western Cape Rock lobster, *Jasus lalandii*, as part of the Benguela Ecology Programme; provides advice to governmental authorities, among others, on the management of the South African coastal zone, including estuaries, in terms of conservation, development, etc.

Estuarine and Coastal Research Unit (ECRU)
This Unit, which is part of the Division, reviews knowledge, collects information, and promotes and coordinates research on estuaries and the coastal environment aimed at the development of a cohesive management policy for the South African coastline; assists in *ad hoc* work aimed at

resolving problems related to developments on estuarine flood plains and coastal dunes, the assessment of the potential effects of proposed dams, the construction of bridges, etc; collaborates closely with the Sediment Dynamics Division of NRIO as well as with universities, museums and other research institutes.

Marine Chemistry Division

Head: Dr G A Eagle X 298

Research on the chemical processes in the marine and estuarine environment; investigations, in collaboration with other divisions on the distribution of various chemical constituents within this environment; measurement of the concentrations of trace metals in various compartments of the marine environment, particularly sediments and biota, and study of mechanisms by which biota are able to detoxify trace metals; development of chemical methods for the identification of the accumulation of raw sewage which has been discharged into the ocean; laboratory and field studies of chemical reactions during estuarine mixing, changes in the concentrations of various chemical constituents with changes in salinity, the effects of various environmental variables on the rates of these changes, and the role of nitrogen, particularly organic nitrogen, in estuaries.

Marine Geoscience Division

Head: Dr I L van Heerden

Research on ancient and modern sedimentary processes along the South African continental margin; detailed study of sediment/current interaction on the continental shelf along the East Coast of southern Africa between Mozambique and Algoa Bay; investigations into bedform development in the flow field of the Agulhas Current and potential bedload exit points by spillover onto the upper continental slope via submarine canyons and other topographic irregularities along the shelf break; establishment of the dispersal patterns and mechanisms of bedload and suspended materials from their source areas to sinks, including their *en route* modifications and depositional products as part of the Agulhas Bank Studies; geological and geophysical site surveys for coastal engineering projects along the coast using sophisticated geophysical techniques such as side-scan sonar and high-resolution seismic reflection profiling.

In these studies attention is given to the Quaternary evolution of the continental shelf in order to provide a meaningful geological framework within which modern sedimentary processes can be interpreted.

COASTAL ENGINEERING AND HYDRAULICS DIVISIONS

Deputy Director (Coastal Engineering and Hydraulics): Mr K S Russell X 343

Coastal Hydrodynamics and Water Quality Division

Head: Mr G Toms X 320

Development and application of hydrodynamic numerical models to coastal engineering problems - one-dimensional models to simulate flow in rivers and estuaries, and two-dimensional models in studies of tidal circulation and harbour resonance; routines for the transport and dispersions of pollutants and the simulation of water quality are linked to the water movement models; studies of the design of ocean outfalls to achieve required dilutions of effluent involving extensive fieldwork to quantify factors influencing dilution at proposed discharge sites; study, development and application of dilution prediction techniques.

Coastal Sediment Dynamics Division

Head: Dr D H Swart X 270

Sections: Coastal Dynamics, Estuarine Dynamics and Wave Dynamics.
Investigations into sediment movement on coastlines and in estuaries; erosion and accretion of beaches and resulting shoreline changes; harbour siltation; stability of estuary mouths; wave/sediment interaction and general bridge scour problems; investigations with either theoretical or small-scale hydraulic models; post-construction surveying of schemes in which the Institute has been involved, including coastal and hydrographic surveys and monitoring of estuary mouths; basic research on sediment dynamics in the laboratory and in the field, on the theory governing coastal processes with the aim of improving predictive techniques.

Maritime Structures Division

Head: Mr J A Zwamborn X 310

Studies the design of harbours and coastal structures, such as the design and stability testing of rubble mound and composite breakwaters with the aid of physical models; fundamental research on breakwater units, particularly the dolos unit (developed by the South African Railways and used internationally); the refraction, diffraction and reflection of waves; study of the behaviour of ships in relation to harbour design; prototype monitoring of the motions of large bulk carriers to determine under-keel requirements in entrance channels to harbours; study of the berthing requirements of moored ships; evaluation of small-craft harbours and launching sites along the South African coast; undertakes overseas contract studies related to harbour entrance and breakwater design.

Facilities: Halls with space for the construction of large hydraulic coastal scale models with means for wave generation, current flow and tidal control and a wind/wave flume (150 m long, 3 m wide and 2 m deep) and various other flumes; a mathematical model to simulate the motions of both free-moving and moored ships and to determine mooring forces is available and is being calibrated against prototype and physical model data. This model can also deal with other floating structures, e.g. platforms.

TECHNICAL AND INFORMATION DIVISIONS

Coordinator: Mr C C Stavropoulos X 241

Electronic Systems Division

Head: Mr S G Holroyd X 398

Groups: Electronics and Instrumentation, Marine Operations Support and Data Processing. Development of specialized instrumentation such as random-wave generating equipment for hydraulic model testing; provision of data acquisition systems; automation of the data-acquisition and control systems; maintaining and servicing this equipment in the field and in the laboratory; editing and pre-processing of research data; development of new laboratory facilities; improvement of scientific equipment in the research vessels.
Facilities: Two minicomputers and facilities for reading magnetic cassette tapes with conversion to 9-track computer-compatible tape.

Publications and Technical Information Division

Head: Mr J F Herbst X 250

Provides publishing, publicity and liaison services for the Institute. It also includes the Institute Library (which provides a national library service in certain branches of marine science and technology) as well as a drawing office, photographic section and duplicating section.

South African Data Centre for Oceanography

Head: Mr N M Walters X 300

Compiles, stores and makes available oceanographic data of interest to South African oceanographic researchers and industry; functions as the official link with foreign oceanographic data centres.

Facilities: Interactive and batch terminal facilities on a direct link to the CSIR's centre in Pretoria.

NATIONAL TIMBER RESEARCH INSTITUTE (NTRI)

Scientia, Pretoria
P O Box 395, Pretoria

Telephone: National (012) 86-9211
International + 27 12 86-9211
Telegrams: NAVORSHOUT, Pretoria
Telex: 3-21312

Chief Director:	Dr A Pizzi	X 2681/2
Director:	Dr H Scharfetter	X 3742
Deputy Director:	Mr P Sorfa	X 4150
Institute Secretary:	Mr P S Oosthuizen	X 2692
Total staff:	105	
Research staff:	80	
Annual budget:	R3,2 million	

Established as the Timber Unit in April 1960, became the Timber Research Unit in May 1966, and received full national institute status in February 1976.

The activities of the NTRI are directed and coordinated by an Advisory Committee under the chairmanship of a Vice-President of the CSIR, by sectorial committees representing the major sectors of the forest products industry, and by small working groups in which technical expertise in specific fields of the industry is focussed on directing research projects in those fields.

Functions: To make knowledge and expertise available to enable the forest products industry to make optimal use of South Africa's timber resources.

Research fields: Pulp and paper; carbon from biomass; timber preservation; adhesives; timber structures; mining timber; wood processing; timber harvesting and transport; sawmilling; composite wood products; wood based board products; technology forecasting; techno-economic studies; and fundamental studies.

Close informal links are maintained with the SA Forestry Research Institute (SAFRI) of the Department of Environment Affairs and with the Faculty of Forestry at the University of Stellenbosch.

Liaison Division

Head: Mr P A V Bryant X 4149

Dissemination of research results and technical information on forest products from local and overseas sources; publishing of a quarterly newsletter and a monthly review list of abstracts (AIDS); maintaining a forest products library; representation of the NTRI in an advisory capacity on timber specialist committees; participation in symposia, conferences, congresses and seminars; lectures in timber technology; liaison, publishing and library services.

Special facilities: Classified library; photographic equipment; photocopier; slides, film projector; microfiche reader; display material.

CHEMICAL TECHNOLOGY

Coordinator: Dr A Pizzi X 2681/2

Pulp and Paper Division

Head: Dr J S M Venter X 2524, 4155

Caters for the long-term research needs of the South African pulp and paper industry including the chemical, semi-chemical and mechanical pulping of a variety of fibrous raw materials, development of new pulping and bleaching processes, energy conservation, effluent abatement, the recovery of by-products from pulping spent liquors, and properties of corrugated board and its components; research on carbon from biomass waste.

Special facilities: Equipment to determine fibre dimensions; facilities for chemical, semi-chemical and mechanical pulping, pulp evaluation, paper testing, and analysis of wood and fibres.

Preservation Division

Head: Mr W E Conradie X 4141

The preservative treatment of timber products to resist fungal and insect attacks as well as weathering; field tests to evaluate the durability of treatments and species under various climatic conditions.

Special facilities: Pressure cylinders for impregnation of wood with preservatives; incubators and sterilizers for testing preservatives; infrared and ultraviolet spectrophotometers; atomic absorption spectrometer; high-pressure, liquid phase chromatograph; controlled temperature and humidity cabinets.

Polymers, Adhesives and Resins Division

Head: Miss F A Cameron X 4138

Research on the chemistry, manufacturing technology and testing of tannin-based and other wood adhesives; lignin and its derivatives; wood chemistry.

Special facilities: Chromatographic and spectrographic analyzers; testing equipment for glued wood products.

ENGINEERING

Coordinator: Dr H Scharfetter X 3742

Timber Engineering Division

Head: Mr R F P Pienaar X 2525, 2534

Research into the more effective utilization of wood as a structural material through the development of better knowledge of the strength properties of

timber, finger joints and mechanical fasteners used in timber; improvement of methods of stress grading; research into the design and construction of timber roof trusses, portal frames, laminated beams, and composite structures of timber and plywood.

Special facilities: Testing rig for roof trusses (up to 20 m span x 8 m high x 50/t capacity); 35/t and 25/t universal testing machines (one with cyclic loading facility); 200/t press for testing mining supports; special laboratory simulator for mechanical stress-grading; stress-grading machines.

Fundamental Studies Division

Head: Dr M Bariska X 2588, 4157

Research on fracture mechanisms in wood; wood anatomy; growth stresses in timber; piezoelectric effects; wood/water relationships.

Special facilities: Scanning electron microscope with mechanical testing, cryogenic stages, video monitoring and recording facility; light photomicroscope; water sorption apparatus.

Computer and Mathematical Services Division

Head: Mr D J T van Niekerk X 3151, 3398

Development of computer simulation models and costing models for the sawmilling industry; development of process control programs on microcomputers for industrial processes and laboratory testing equipment; statistical and econometric models for the timber industry; operational research projects to improve the economic utilization and processing of forest products, mainly in the sawmilling industry.

WOOD TECHNOLOGY

Coordinator: Mr P Sorfa X 4150

Solid Wood Division

Head: Dr H-P Stöhr X 2863

Drying of timber - basic physical aspects of drying and development of improved drying techniques and equipment.
Sawmilling and wood machining - development of processing techniques to improve recovery and quality of sawn and machined timber.
Development of management systems for wood-processing operations.

Special facilities: Computerized mobile laboratory to monitor drying kilns; timber drying kilns; heavy industrial timber processing machinery.

Composite Products Division

Head: Mr P Sorfa X 4150

Research on glued laminated timber, laminated sleepers, end-jointing and edge-jointed products; wood-mineral composites and other structural composites; composition boards; particle boards and veneer products.

Special facilities: Press for manufacture of plywood and particle board; finger-jointing machinery; laminating equipment.

Timber Economics Division

Head: Mr W F Lubbe X 3398

Techno-economic investigations into the forest products industry and compilation of economic data to define research needs and to evaluate the market potential and economic benefit of current scientific research projects; provision of marketing information and forecasts to the forest products industry.

Engineering Services Division

Head: Mr D T Priest X 2592, 2863

Research on cutting tools and wood processing machinery.

Special facilities: Saw-doctoring equipment and cutter maintenance facilities.

Special Projects Section

Head: Mr F R Hose X 2685

Research on generation of energy from wood waste; the engineering design of new equipment for research and wood processing.

Special facilities: Wood-gas generating and evaluating equipment.

SOUTH AFRICAN ASTRONOMICAL OBSERVATORY (SAAO)

Observatory Road, Observatory
P O Box 9,
Observatory, 7935

Telephone: National (021) 47-0025/8
International + 27 21 47-0025/8
(02392) 182/205
Telegrams: ASTRONOMER, Cape Town
Telex: 57-20309 (Cape Town)
57-20455 (Sutherland)

Chief Director: Dr M W Feast X 111
Institute Secretary: Mr R J S Mayers X 142
Total staff: 84

Functions: The SAAO is administered by the CSIR as a national research institute and is financed jointly by the CSIR and the Science and Engineering Research Council (SERC) of the United Kingdom. It provides observation and other facilities for astronomers from the United Kingdom and from South African universities and is also the national centre for astronomical research. Staff and visiting researchers are engaged in a wide variety of astrophysical studies including variable stars, globular clusters, galactic structure, the Magellanic Clouds and other galaxies.

The South African Astronomical Observatory (SAAO) was established in 1972. Equipment and staff from three observatories (the Royal Observatory, Cape Town, founded in 1820, the Republic Observatory, Johannesburg, founded in 1903, and the Radcliffe Observatory, Pretoria, founded at Oxford in 1772 and transferred to Pretoria in 1938) were combined to form a major international facility. The main observatory is situated at Sutherland in the Cape Province (348 km by road north-east of Cape Town at an altitude of 1 762 m). The former Royal Observatory in Cape Town is used as the SAAO headquarters.

Photoelectric photometry

Project Leaders:		
(Photometric Systems)	Dr J W Menzies	X 132
(Instrumentation)	Dr D Kilkenny	X 130

Infrared studies and general instrumentation

Project Leader:	Dr I S Glass	X 136

Spectroscopy and photographic photometry

Project Leader:	Dr T H H Lloyd Evans	X 137

Electronic Imaging and Processing (CCD)

Project Leader:	Dr A R Walker	X 116

Miscellaneous scientific support activities and Astrometry

Project Leader:	Mr J Churms	X 125

Computer facilities

Project Leader:	Dr L A Balona	X 115

Special facilities:

Sutherland
1,9 m reflector: Newtonian direct photography, including Wynne corrector; Cassegrain image tube grating spectrograph and photon counting detector, prismatic spectrograph, photo-electric photometer; coudé grating spectrograph, including photo-electric radial velocity spectrometer under

computer control, low resolution infrared spectrometer, three-channel scanning infrared photometer, infrared photometer and bolometer.
1,0 m reflector: Cassegrain computer-controlled photo-electric photometer, charge-coupled device camera.
0,75 m reflector: Cassegrain infrared photometer - the University of Cape Town highspeed photometer is also used with this telescope. The same mounting carries 200 mm and 255 mm refractors for direct photography simultaneously in yellow and blue.
0,5 m reflector: Cassegrain computer-controlled photo-electric photometer.

Cape Town
A variety of measuring instruments and computer facilities are available in Cape Town. The principal telescopes are a 610 mm refractor and a 450 mm reflector.

Transvaal
The 670 mm visual refractor in Johannesburg is under the care of the National Institute for Telecommunications Research (refer the Director, P O Box 3718, Johannesburg, 2000. Tel. (011) 648-1150).

SOUTH AFRICAN WOOL AND TEXTILE RESEARCH INSTITUTE (SAWTRI)

P O Box 1124,
Port Elizabeth, 6000

Telephone: National (041)53-2131
International + 27 41 53-2131
Telegrams: SAWTRI, Port Elizabeth
Telex: 24-3203

Chief Director:	Dr D W F Turpie	X 111
Director:	Dr L Hunter	X 113
Institute Secretary:	Mr G F de Jager	X 112
Total staff:	147	

Functions: The Institute provides a comprehensive range of services to the local textile, clothing and related industries to reduce the country's dependence on foreign sources of such services, and to improve the efficiency of the industry and the quality of its products. The services include contract research projects, consultancy, handling of technical enquiries, engineering, provision of limited training facilities, library and information services.

Contact between SAWTRI and the textile industry is made and maintained by the CSIR Regional Office in Port Elizabeth which operates from SAWTRI.

Fabric and Garment Manufacture Group

Group Leader:	Mr G A Robinson	X 225
Head: Weaving:	Vacant	
Head: Knitting:	Mr P C M Shorthouse	X 135
Head: Clothing Technology:	Dr S Galuszynski	X 142

Investigates knitted and woven structures and carries out knittability and weavability studies and product development; carries out research on problems encountered in garment manufacture; provides technical services related to the making of clothing.

Special facilities: Fully fashioned, flat-bed knitting machines; circular, single and double jersey machines; Saurer automatic looms; Sulzer and Dornier shuttleless looms; Hergeth sample warping and sizing machines; cone winder with Classimat fault analysis and yarn cleaners; automatic drawing-in and knotting equipment; industrial sewing machines; Reliant continuous fusing press; WIRA 'Pukkatester'; utility steam presses; testing equipment to measure sequability and seam slippage and strength and fabric shrinkage; SAVIO cone winder; half-hose knitting machine; warp knitting machines.

Long Staple Processing Group (Worsted and Woollen)

Group Leader:	Dr D W F Turpie	X 111
Head: Worsted Processing:	Mr M A Strydom	X 229
Head: Woollen Processing:	Mr J P van der Merwe	X 258

Fundamental investigations into the processing characteristics of natural fibres during topmaking; studies of yarn production in terms of the effect of fibre properties on spinning performance and yarn properties and the requirements for different end products.

Special facilities: Full-scale carding, gilling and combing equipment; backwashing unit; top testing equipment; staple length and strength testing equipment; worsted drawing set; Rieter spinning frames (one with Sirospun conversion); Repco self-twist spinner; SKF spin tester; cone winder and fancy yarn twister; yarn brushing machine; stretch yarn assembly winder; willey fearnaught; full-scale woollen card with automatic hopper and six height condenser delivering 120 good ends; woollen ring spinning frame; needle punching machine; sample carding machine for small batches.

Machine Development and Innovation Group

Group Leader:	Mr J Cizek	X 219
Head: Technical Services:	Mr D J M Currie	X 148

Design, development and construction of processing machinery and testing equipment; improvement of existing machinery and equipment; maintenance and transport facilities to the other groups and engineering and other technical services to industry.

Special facilities: Machine design facilities; argon arc electric and oxy-acetylene gas welding equipment; sheet metal working equipment; a comprehensive range of lathes, presses, drills, milling machines and small tools; Hewlett-Packard 45 microcomputer with matrix thermal graphic printer and X-Y plotter.

Short Staple Processing Group

Group Leader:	Dr L Hunter	X 113
Head:	Mr K W Sanderson	X 222

Spinning trials on new and existing local cotton cultivars; routine analyses of the fibre properties of the cotton crop; studies the production and properties of yarns produced on various spinning systems; studies the processing of other short staple fibres - natural and synthetic and blends.

Special facilities: Full-scale short staple processing line including a complete blowroom; single, cross roll tandem and high production cards; drawframe and speed-frame; comber; ring, rotor, Depco, Dref II, Dref III and floating ring spinning machines; Schweiter cone winder with splicer; miniature processing line which converts small quantities of cotton into yarn for quick screening tests.

Textile Physics, Industrial Enquiries, Statistics and Electronics Group

Group Leader:	Dr L Hunter	X 113
Head: Textile Physics:	Mr S Smuts	X 140
Head: Physical Testing:	Mr A L Braun	X 127
Head: Industrial Enquiries and Chemical Testing:	Mr E Weideman	X 128
Head: Statistics:	Mr E Gee X 214	
Head: Electronics:	Mr W Frazer	X 211

Investigations into the physical properties of fibres, yarns and fabrics and their mathematical interdependence; statistical and computer-assisted analyses of test results; general data-processing services to other departments as well as to the textile industry in the form of testing and investigations of technical problems - more than 150 different tests (physical and chemical); electronic development and maintenance work.

Special facilities: Instruments for the testing of fibre length and fineness; yarn evenness and strength testing equipment; equipment for testing yarn twist, friction and hairiness; equipment for measuring fabric tensile properties, abrasion, wrinkle resistance and crease recovery, drape, air permeability, water repellency, pilling, snagging and sewability; microscopes; Instron tensile tester; Olivetti P6060 computer; Olivetti 6040 minicomputer; Want 600 and Hewlett-Packard 97 programmable desk calculators.

Wet Processing and Textile Chemistry Group

Group Leader:	Dr N J J van Rensburg	X 134
Head: Dyeing:	Dr F A Barkhuysen	X 235
Head: Finishing:	Mr G H J van der Walt	X 234
Head: Textile Chemistry:	Dr A P B Maasdorp	X 132

Head: Wool Scouring and Wool Scouring Effluent Treatment:	Dr T E Mozes	X 158

Investigates the modification of textile fibres by chemical treatment to improve their chemical and physical properties; studies methods to improve the efficiency of dyeing and finishing processes, with special attention to reduced energy consumption and more efficient use of water and chemicals; investigates modification of existing techniques and the development of new methods; studies the scouring process in terms of efficient water usage and effluent treatment.

Special facilities: Ultraviolet, infrared and atomic absorption spectrophotometers; equipment for electrophoresis and amino acid analysis; polarometric, potentiometric and conductiometric equipment; liquid scintillation counter and radio-chromatograph scanner; gas chromatograph; microcalorimeter; elemental analyser; I.S.I. scanning electron microscope and sputter coater; total carbon analyser; Karl Fisher equipment for water content determination.
Goniophotometer (lustre); colorimeter and spectrophotometers; Xenotest (light-fastness); Hunterlab colour difference and whiteness meter; fluorescence microscope with camera; rotary microtome with knife sharpener; high-speed centrifuge; Elrepho whiteness meter; colour fastness testing equipment.
Equipment for treating and dyeing loose stock, yarns and fabrics on laboratory, pilot and industrial scales; radio frequency continuous top dyeing machine; solvent dyeing and drycleaning machine.
Liquid ammonia merceriser; radio frequency drying and curing equipment; steam autoclave; compressive shrinkage machine; scouring, crabbing, steaming, brushing and cropping machines; shrinkrest treatment plant; Hoffman and Kannegieser presses; stenter drying and curing machine; Cubex and household washing machines; foam drying and finishing machine; calender machine; laboratory padders and curing ovens.
Pilot scale scouring trains with carbonizing facilities; centrifuges, including horizontal decanter and a pilot filtration plant; Westphalia grease separator.

Publications and Information Group

Group Leader:	Mr N J Vogt	X 255
Head: Publications and Information:	Mr P Horn	X 249
Librarian:	Mrs S Horn	X 240

Publication of SAWTRI technical reports, special reports, a quarterly *SAWTRI Bulletin*, the *Annual Report*, and other scientific and semi-scientific material; preparation of articles for the press, radio and television; library, information and liaison services; publication of occasional SAWTRI Information Pamphlets; a current awareness service to the textile industry through a monthly publication, the *SAWTRI Digest*.

Administration and Associated Services

Group Leader:	Mr G F de Jager	X 112
Accountant:	Mr J Beer	X 114

CSIR Regional Office (Publications, Information and Liaison)

Regional Representative:	Mr N J Vogt	X 255

TECHNICAL SERVICES DEPARTMENT (TSD)

Scientia, Pretoria
P O Box 395, Pretoria, 0001

Telephone: National (012) 86-9211
International + 27 12 86-9211
Telex: 3-21312SA

Head:	Mr P Lasserre	X 3201
Deputy Head:	Mr C P van der Berg	X 3222
Total staff:	328	

The Department undertakes the design and manufacture of research equipment and renders other essential services to the national laboratories and institutes of the CSIR via its Graphic Arts, Transport and Stores Sections.

Workshops: Manager:	Mr J S R Cater	X 3202
Central Machining Workshop: Head:	Mr J R Brown	X 3248
Wood Workshop: Head:	Mr W J Müller	X 3245
Sheet-metal and and Welding Workshop: Head:	Mr A D Niemand	X 3251
Glassblowing Workshop: Head:	Mr H W Schönberger	X 2606

Transport Administration

Transport Officer:	Mr T S van der Walt	X 3752
Transport Workshop: Head:	Mr T C Cox	X 3234
Transport Bookings: Head:	Mr G C de Winnaar	X 3233

Stores

Controller of Stores:	Mr J D Bredenkamp	X 3214
Technical Store: Head:	Mr H B J Rehork	X 3256
Chemical Store: Head:	Mr P J van Deventer	X 2605
Electrotechnical: Store: Head:	Mr S M van Niekerk	X 3010
Stationery Store: Head:	Mr B van Zyl	X 3231

Design Office: Manager:	Mr J F de M Maré	X 3678
Graphic Arts Division: Manager:	Mr T F Flaherty	X 3751
Training Centre for Instrumentmakers: Manager:	Mr H G van Kasterop	X 3243

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CSO: 3400/56

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